FINAL REPORT

Energy Profile : Zimbabwe

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August 1991

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Duration of Project : 1990/10 TO 91/02
NEC Division : Integrated Energy Planning
Project Ref No : 7330411001 (NEC)
IER 041 (ENG RES)

CERTIFIED AN OFFICIAL FINAL REPORT: G.P.V. Venter DATE: 15 Aug 1991

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1. INTRODUCTION[1]

This report is one of a series summarizing the energy situation in sub-equatorial Africa. The purpose of the series is to analyze the energy position for those organizations trading or intending to trade with these countries, or for organizations entering into joint ventures with these countries. It is also the intention to use the individual reports to determine the possibility for energy interchange in the region and the potential for energy supply and demand in the region.

Use has been made of a number of sources for the statistical information and these do not always agree because of the definitions used for the various components. Therefore a perfect match in the resultant data should not be expected.

Substantial use has been made in the compilation of this report of data and information from the World Bank, whose permission to use the information is gratefully acknowledged.

This series of reports has been solicited and sponsored by the National Energy Council and their assistance with the preparation of this report is gratefully acknowledged.

2. COUNTRY PROFILE

2.1 Introduction

Zimbabwe, previously known as Southern Rhodesia, was governed by the British South Africa Company of Cecil Rhodes until 1923. In 1923 a referendum of the whites in Southern Rhodesia voted against incorporation into South Africa and it became a self-governing colony. In 1953 the British Government tried to rationalize their colonies in the region and joined Southern Rhodesia, Northern Rhodesia, and Nyasaland into the Central African Federation. The granting of independence to the other two partners resulted in the dissolution of the Federation in 1963. Northern Rhodesia became Zambia and Nyasaland became Malawi.

Rhodesia, determined to prevent black rule, declared unilateral independence in 1965. Britain reacted by imposing growing economic sanctions, a move which was followed by United Nations sanction in 1967. However, a number of countries such as South Africa and Portugal refused to impose sanctions, whilst others did nothing to stop companies in their country from trading with Rhodesia. Growing opposition to the government came from militant black organizations. A number of militant organizations were banned and proceeded to wage war on the government from bases in Mozambique and Zambia. The two main groups waging the war were the Zimbabwe African People's Union (ZAPU) and the break-away Zimbabwe African National Union (ZANU). ZAPU members were predominantly Ndebele whilst ZANU had the support of the Shona tribe.

An internal settlement was reached in 1978 between the ruling Rhodesian Front party under the premiership of Ian Smith and a grouping of black movements under the leadership of Bishop Abel Muzorewa. In 1979 the British Government persuaded all the parties to meet at the historic Lancaster House meeting in the U.K. In 1980 elections were held under the control of the British Government. The ZANU party won the majority of the seats and took control under the premiership of Mr Robert Mugabe. A separate white voters' roll contained 20 seats in the 100 seat parliament. In 1987 the 20 seats reserved for whites were abolished.

The rival ZANU and ZAPU parties have been discussing unity following a number of years of enmity and repressions. This was in line with President Mugabe's avowed intent of forming a single party state. Though there was significant opposition to a one-party state, it was anticipated that this would come about after the elections at the beginning of 1990. This in fact did not occur and there appears to be a growing move towards a more liberal structure. There are however fears amongst the white farmers, who between them own some 40% of the farming land, that there will be a large land redistribution.

The Zimbabwe Government has adopted a ~~generally world~~ non-aligned attitude, with Mr Mugabe being chairman of the Non-Aligned Movement during the period 1986 to 1989. Zimbabwe is an active member of the Organization of African Unity. Relations between Zimbabwe and the U.K. have been good, though relations with the U.S.A. deteriorated after the latter's invasion of Granada and

because of the USA's attitude to Nicaragua. Relationship with the USSR was also cool after the invasion of Afghanistan but has recently improved.

Zimbabwe is a leading force in the Southern Africa Development Co-ordination Conference (SADCC) and has been in the forefront of efforts to decrease reliance on South Africa.

2.2 Demography

The population according to a 1988 estimate was 8,88 million, of whom approximately 1,6 million live in the 7 largest towns. Of the total population some 120 000 are white. The average population growth rate during the period 1982 to 1988 has been 2,7% per annum. However, the rate of urban population growth is much higher than this because of the move from rural areas to urban areas. It is estimated that the urban growth rate is approximately 7% per annum. Immigration is mainly from other African countries especially for domestic and farm workers.

The majority of Zimbabweans belong to the Shona tribe who out-number the Ndebele tribe by four to one.

2.3 Economy

Zimbabwe has a diversified economy which is rapidly changing from an agricultural economy to an industrial one[2]. Figure 1 shows the changes that have occurred in the contribution to Gross Domestic Product (GDP), with the industrial sector moving from 34% of the total GDP in 1967 to approximately 43% in 1987, whilst the agricultural sector has decreased from 20% to 11%. During this period the economy in terms of GDP per capita, has remained fairly constant in real terms, as shown in Figure 2. The change from an agricultural to an industrial economy is shown in Figure 3 which is a plot of the ratio of the GDP due to agriculture to the GDP due to industry. In view of the difference in energy usage by these two sectors, this will have a significant effect on energy usage.

During the Post-Unilateral Declaration of Independence (UDI) days, after 1965, the economy grew rapidly as the government was forced to diversify the economy and the pressure was to manufacture locally. This is indicated in Figure 4 which

shows that in the period 1967 to 1974 real growth in GDP was positive and running at over 5% per annum. In fact in 1970 growth was an exceptional 22% per annum. However, by 1975 the cost of the internal war coupled with international sanctions had resulted in a deterioration of the economy and growth became negative. The result of independence following the Lancaster House agreement, coupled with good rains and the lifting of sanctions, resulted in an increase in the economy with growth becoming positive and rounding at 10% p.a. However, this improvement was short-lived and two years later the economy again exhibited a negative growth rate and has been running at around 2% p.a since then. The national economic development plan formulated in 1981 expected an annual real growth of 8% from 1982 to 1985, with a large investment and private capital inflow of Z$176 million annually. However, the world economic situation, years of drought and the conflicts in Matabeleland and Mozambique, together with inadequate planning, resulted in the growth rate being much lower than planned, with real growth only just above zero. The next planning period from 1986 to 1990 called for a more realistic growth of 5,1%. In 1985 the growth was 5,3% and it is estimated that growth was 4% in 1989.

Over the 1984-1988 period the main growth in the economy has been in the area of electricity & water (16,0% p.a), agriculture (7,6% p.a), and manufacturing (3,1% p.a).

The sectorial contribution to GDP in 1988 is shown in Table 1.

Table 1: Sectorial contribution to GDP[2] - 1988

Sector	Z$ Million	%
Agriculture & forestry	1283	15,5
Mining & quarrying	529	6,4
Manufacturing	1441	26,5
Construction	168	2,0
Electricity & water	374	4,5
Transport & communications	423	5,1
Distribution, hotels, etc.	1032	12,4
Finance & real estate	537	6,5
Public administration	616	7,4
Services & other	1136	13,7
GDP at factor cost	8295	100

Zimbabwe is generally self-sufficient in food and during average rainfall years is able to export. Agricultural exports include meat, maize, tobacco, cotton, and sugar. In drought years maize has to be imported; 200 000 tons had to be imported in 1984 for instance. Tobacco was the most significant crop before UDI amounting to 73% of agricultural sales. This has dropped and in 1988 accounted for only 34%. However, Zimbabwe is still the third largest exporter with about 15% of the world market.

Mining was the reason for the development of the country's economy and is still the largest foreign currency earner. Over 90% of production is exported and in 1988 export earnings rose by 20,9%. The main earners are gold, coal, asbestos, and nickel. The values of mineral production in 1987 were as shown in Table 2.

Table 2. Value of mineral production[2] in 1987

Mineral	Value (Z$ Million)
Gold	349,9
Coal	103,4
Asbestos	97,8
Nickel	73,4
Copper	45,9
Chrome ore	44,1
Iron ore	28,9
Silver	15,8
Tin	11,5
Others	44,9
Total	815,6

Although President Mugabe called for a Marxist-Leninist single party state at a congress at the end of 1989, this has not materialized. Consultations with the World Bank have resulted in an approach to a liberalization of trade. It is likely therefore that the de facto capitalist economic system will remain, even though land reforms may lead to land redistribution.

A decreased GDP growth rate and increased inflation are seen for the near term, but the prospects for improved economic growth in the future are good.

3 ENERGY

3.1 Introduction

Zimbabwe has no domestic oil or gas resources but, has large deposits of coal, substantial fuelwood resources, and abundant hydro-electric potential[3]. The figures for energy consumption show that the largest input is from fuelwood followed by coal, oil, and electricity.

The use of energy by the various economic sectors is shown in Figure 1. Energy consumption has shown an overall increase since 1970. This has occurred during a period when the economic activity was almost constant in real terms per capita. Part of this growth in energy use was due to the change in the sectorial mix of the economy where the industrial component of the GDP rose from 36% of the total to 43% of the total over a period of 17 years. The net growth in energy consumption was 1,9% per annum during the period 1970 to 1988, whilst the industrial component changed by 1% per annum.

The utilization of energy in the various economic sectors in 1987 is shown in Table 3.

Table 3. Percent energy consumption by the various economic sectors (1986)[4]

Sector	Coal	Oil	Elect	Total
Iron & steel	14,2			14,2
Non-metal minerals	2,8			2,8
Other industry	12,3	2,7	15,5	30,5
Road transport		13,9		13,9
Air transport		4,8		4,8
Other transport	3,8	2,7		6,5
Agriculture	7,2	4,7	2,5	14,4
Public/commerce	4,9		2,3	7,2
Residential	1,4	0,1	4,2	5,7
Total	46,6	28,9	24,5	100,0

Final consumption of commercial and traditional energy has been rising steadily (Figure 6) though the per-capita consumption has been falling steadily (Figure 7). The energy-economy relationship during this period showed an increase in the efficiency in the use of energy per unit of GDP, as shown in Figure 8. The relationship between energy and GDP per capita is illustrated in Figure 9 which shows the good correlation between economic activity and energy usage.

Because of the importance of the industrial sector the energy per capita is higher in Zimbabwe than in many other countries in the region. Also, since there is such a high reliance on coal in the secondary energy sector, the problems of energy import are not as serious as in other developing countries.

3.2 Energy Institutions

3.2.1 General

In 1980 the Ministry of Mines was broadened to become the Ministry of Mines and Energy Resources. This however, did not work since the responsibility for energy remained fragmented. In order to be able to implement measures, which the government felt needed urgent attention, a number of energy activities were consolidated into a new Ministry of Industry and Energy Development (MIED). The energy component of the Ministry is divided into four main areas, namely, electric power, coal policies, liquid fuels, and energy research and development. The MIED suffers from a shortage of staff and technical expertise.

3.2.2 Electricity

The electricity sector has suffered in the past from fragmentation of the generation and transmission sub-sectors. Thus individual municipalities, the Central African Power Corporation (CAPC) and the Electricity Supply Commission (ESC) all supplied electricity and the CAPC sold electricity to ESC who in turn sold it to individual consumers or in bulk to a municipality. In 1986 the ESC became the Zimbabwe Electricity Supply Authority (ZESA) and took over the generation of electricity both from the Kariba Dam plant previously operated by CAPC, and the power plants in Harare and Bulawayo which were previously operated by the municipalities. ZESA sells electricity directly to individual consumers.

The role of the Central African Power Corporation, formed to operate the Kariba Dam and to distribute electricity within Zimbabwe and Zambia, changed with the dissolution of the Federation and in 1987 it was reconstituted as the Zambezi River Authority by Acts of parliament in Zimbabwe and Zambia. The main function of this new Authority is to operate, monitor, and maintain the Kariba Dam complex, and to investigate the construction of new dams on the Zambezi River.

With the formation of ZESA, electricity planning has become more co-ordinated, though detailed control by the MIED means that communication channels are possibly longer and slower than they should be for best management.

3.2.3 Coal

The mining of coal is controlled by the Ministry of Mines and the MIED, with the Ministry of Mines administering the Mines Act and issuing exclusive prospecting rights and special prospecting grants. The MIED is responsible for formulating and implementing policies on coal development and with integrating them with overall energy and industry policies.

Coal exploration is being carried out by private companies such as Shell, Rio Tinto, Goldfields, and Anglo-American.

The parastatal Industrial Development Corporation (IDC) is involved with some of the financial aspects of the coal industry and they are expected to play a greater role in the future.

3.2.4 Petroleum

The MIED controls and formulates policy for the petroleum sector, though the Ministry for Trade and Commerce (MTC) is responsible for pricing policy. Distribution is in the hands of private enterprise consisting of Mobil, Shell, BP, Total and Caltex. An oil importing company, the National Oil Company (NOCZIM) has been formed to be responsible for oil procurement. NOCZIM arranged long term contracts with the Kuwait Petroleum Corporation for part of its demand but allowed the contract to lapse in 1988. It is rumoured that half of Zimbabwe's supply was obtained on the spot-market through a consortium led by Mobil Oil. This consortium was completely privately owned but was responsible to MIED.

3.2.5 Fuelwood

Whilst there are various bodies responsible for the control of forestry, there was no institution responsible for the supply of fuelwood or charcoal. Following recommendations from the World Bank in 1982, the Government has assigned principal responsibility for reforestation and fuelwood programmes to the Forestry Commission and to the Department of Agriculture. No information is available on the effect of this delegation of responsibility.

4 RESOURCES

4.1 Fuelwood

Zimbabwe has a predominantly dry woodland vegetation with a low annual rainfall varying from 300 mm per year in the south to 1000 mm in the north. Mean annual forest growth rates are low[3] with a once-only recoverable rate of 74 m^3/ha compared with 600 for rainforests in central Africa. In densely populated areas the fuelwood shortage is critical. In general overall fuelwood supplies exceed demand, but due to the high cost of transport and the low level of income of users, the distribution to areas in which shortages occur is limited.

Table 4. Estimated fuelwood demand and capacity for fuelwood production in communal areas[3]. (Figures in 000's)

Province	Land Area (ha)	Wood-land Area (ha)	Wood Prod-uction (m^3/yr)	Wood Cons-umption (m^3/yr)	Surplus (m^3/yr)
Manicaland	1930	395	501	589	-88
Mashonaland - E	1169	221	281	387	-106
Mashonaland - C	1658	152	193	241	-48
Mashonaland - W	1270	545	692	210	482
Midlands - N	1705	733	931	326	712
Midlands - S	914	100	127	326	-199
Victoria	2086	444	564	628	-64
Matabeleland - N	2948	1280	1627	1355	272
Matabeleland - S	2385	972	1234	930	304
Total	16065	4842	6150	4885	1265

The estimated production potential for fuelwood in the various regions of the country is given in Table 4.

With the small surplus available the potential capacity will be used up within a decade. The only areas where supply is adequate is in North Midlands and in West Mashonaland. Thus the fuelwood situation is critical unless commercial wood-lots can be created. With the lack of control over fuelwood supply this is unlikely to take place.

The present charcoal production is small but there is potential for charcoal production from forestry residues.

4.2 Petroleum

Zimbabwe's geology consists mainly of basement and metamorphic rocks and therefore the potential for petroleum reserves is small. However, there is an area of sedimentary rocks in the western and north-western region, which could have some petroleum content.

It was announced in 1990 that Mobil Oil was about to begin exploration in the Zambezi Valley.

4.3 Coal

Zimbabwe has large reserves of coal which has been the main contributor to the country's energy need. The coal reserves are spread through 24 coalfields divided into those in the Zambezi Valley and those in the Sabi Limpopo region. It is estimated[3] that coal resources amount to 29 202 million tons of which 2 194 million tons are classified as Reserves and 27 008 million tons are in the Resource category. The division of this coal into the main coalfields is shown in Table 5.

Table 5. In-situ coal reserves and resources[3] (Million tons)

Area	Resources	Reserves	Total
A Zambezi Basin			
Wankie	561	1188	1749
Lubimbi	22120	163	22283
Lusulu	2750	250	3000
Lubu-Sebugu	83		83
Sengwa		400	400
Marowa		15	15
Sessami-Kaonga	1000		1000
	26529	2001	28530
B Sabi-Limpopo Basin			
Massabi	30		30
Bubye	30	30	60
Sabi	419	163	582
	479	193	672
Grand Total	27008	2194	29202

Of this coal approximately 10% is coking coal and the remainder is steam coal. Coal seam thicknesses are high with average thicknesses, in those areas where adequate drilling has been carried out, of 9 to 10 metres of which the bottom 2 to 5 metres are coking quality.

4.4 Hydro-electricity

Because of the rainfall pattern in Zimbabwe, most of the river flow is intermittent and not suitable for significant hydro potential. The two rivers which are exceptions to this are the Zambezi and the Sabi which are fed by various perrenial rivers. With a present installed hydro capacity on the Zambezi of 1374 MW, there is a further potential for 5030 MW, to be shared with Zambia. Therefore the Zimbabwe's share of additional capacity on the Zambezi is 2515 MW with an average energy capacity of 13 285 GWh per year. These hydro extensions could take place at the Batoka Dam, extensions to the North and South Bank of Kariba, the Victoria Falls, the Mupata Gorge Dam, and at Sengwa.

4.5 Gas

Zimbabwe does not have any known gas reserves.

4.6 Agricultural residues

In spite of the fact that most of the population lives in the rural areas, very little attention has been paid to the use of agricultural wastes. Communal land holds about 4,7 million head of livestock[3] and other areas hold some 2,7 million. With the rehabilitation of livestock farming taking place, there will be increasing opportunity for biogas production from waste. However, the contribution from this source is likely to be small in the medium term.

Zimbabwe has investigated the use of vegetable oils to replace diesel fuel, but with the present prices for vegetable oils on the world market, it is unlikely that their use would be economic.

4.7 Renewable energy

Zimbabwe is in a high solar radiation belt and therefore the technical opportunities for the use of solar energy are high. It has some 2 800 sunshine hours per year[3] and an insolation figure of 5,7 kWh/m^2/day [3]. The potential for the utilization of solar energy for crop drying, for hot water production, and for water pumping is available, but the amount which can be developed depends on the economics of each situation. The government has encouraged research into the use of solar energy and it is envisaged that increasing use will be made of it. In comparison with the commercial and traditional forms of energy, it will remain a small quantity and in specific situations.

Meteorological records show that the best conditions for the use of wind energy are along the highveld (near Bulawayo, Que Que, Gatooma, etc) where high wind speeds occur from July to October. The wind power potential is estimated at around 100 watts/m^2. As with solar energy the costs are high compared with commercial energy forms and especially with grid electricity, but there is potential for wind energy utilization in remote areas. The amounts which could be used are small and the best prospect is the traditional one of pumping water.

4.8 Geothermal

In spite of the fact that Zimbabwe is far from the Rift Valley fault with its geothermal activity, there are a number of hot-water springs with temperatures between 31°C and 97°C. It is estimated by the Geological Survey Department that the potential for energy production from these springs is likely to be small.

5 ENERGY SUPPLY AND DEMAND

5.1 General

In common with other African countries, the main energy form used in Zimbabwe is fuelwood and charcoal, the traditional energy forms, which together in 1986 contributed 39% of final energy, as shown in Figure 5. With the lack of planning for fuelwood development, there is likely to be a serious shortage of traditional fuel within the next decade.

Table 6. Final commercial energy demand and energy carrier utilization in 1986 [4]

Sector	Coal	Oil	Electricity	Total
Tons Oil Equivalent 000's				
Industry	778	73	414	1265
Transport	105	569	1	675
Agriculture	191	121	61	373
Commerce	127		59	186
Residential	35	3	110	148
	1236	766	645	2647
Percent				
Industry	29	3	16	48
Transport	4	21		25
Agriculture	7	5	2	14
Commerce	5		2	7
Residential	1		4	6
	46	29	24	100

Of the commercial energy most is used in industry (48% in 1986), followed by transport, agriculture, commerce, and residential respectively. The final energy demand and fuel contribution for 1986 is shown in Table 6.

The growth of energy consumption in the commercial and traditional energy sectors is illustrated on a total energy basis in Figure 6 and on a per capita basis in Figure 7. Whilst the total energy demand has been increasing, the per capita consumption has been decreasing. Such a decrease in per capita consumption could be due to an increased efficiency of usage, a change in the components of the economy, or a decreased GDP/Capita resulting in a decreased ability to purchase energy (see Figure 9). There is no evidence that Zimbabwe has adopted any energy saving methods and therefore an explanation must be sought in the contents of the country's GDP.

It has already been shown in Figure 1 that the GDP components have been shifting from agriculture to industry. Figure 8 shows the change in energy intensity, expressed as TOE per Zimbabwe dollars in real terms (1980 basis) during the period 1971 to 1987. The graph shows the yearly values together with the 3-point moving average line. There is a large amount of scatter in the data, but the curve exhibits the typical form of energy intensity in a country which is moving from an agricultural economy to an industrial one.

Figure 9 is a comparison of the per capita value for final energy consumption in the final sector with the GDP per capita over a 20-year period. The correlation between energy and economy is seen to be particularly strong in Zimbabwe. This cross-correlation is shown in Figure 10 which is drawn for energy/capita versus GDP/capita for various years.

On the basis of the available information, it is still too early to be able to predict whether the energy intensity is likely to increase in the future, as shown by the last three points in Figure 8.

5.2 Fuelwood

The IEA[4] data for the consumption of fuelwood shows that traditional energy amounts to 39% of final consumption. The World Bank[3] has estimated that this figure is 26%. An estimate of traditional fuel consumption is always a difficult task because of the lack of reliable data. Whatever the figure is, it is clear that there will be a serious shortage of traditional fuels within a decade.

It is estimated that consumption of fuelwood can be broken down into the following categories:

Table 7. Fuelwood consumption by usage category

Sector	Percent of total traditional fuel consumption
Rural households	74
Urban households	16
Commercial agriculture	10

For many people in the rural areas fuelwood meets 100% of their energy needs. Of the household usage it has been calculated that cooking accounts for 60% of total usage, heating accounts for 25%, and brewing, baking, etc. account for the remainder.

Fuelwood gathering is normally carried out by women, in bundles of between 24 and 36 kg. Collecting firewood exhibits a seasonal pattern with most of the collecting being made in the dry winter months and decreasing as farming activities pick up in summer.

Commercial farming estates supply farm-workers with fuelwood. For instance, the Triangle Sugar Estate supplies, free of charge, 0,6 tons of firewood per month per family. Urban users of fuelwood normally purchase from retail stalls, and fuelwood supply is becoming a lucrative business.

In agriculture fuelwood is used mainly for tobacco and tea drying. An estimated 16% of the tobacco crop is dried using fuelwood at a rate of 12 kg of wood per kg of cured tobacco.

In addition to fuelwood consumption, commercial plantations and wattle and pine plantations produce waste wood which is used locally for heat generation. Information on the use of milling residues for domestic consumption is scarce. However, one company in Harare produces sawdust briquettes for sale as fuelwood in the local market.

Whilst there is an apparent overall excess supply of fuelwood, as shown in Table 4, distance and transport costs make it uneconomic to transport fuelwood from areas of surplus to areas of scarcity.

5.3 Petroleum products

Zimbabwe's liquid fuel consumption has been growing steadily by 1,7% per annum over the last 15 years, as shown in Figure 11. The largest growth has been in diesel fuel, at the expense of gasoline. Aviation fuel has also been growing[4].

The change in the proportion of diesel fuel and gasoline is illustrated in Figure 12 which shows the ratio of diesel fuel to gasoline for the period 1971 to 1987. This ratio has grown from 1,26 in 1971 to 2,53 in 1987. This growth has been caused by the growth in industrial activity and also by the decline in economic growth which amongst other effects has caused a worsening in the supply situation for motor vehicles.

The main use for oil products is in the transport sector. The breakdown of product consumption by economic sector is shown in Figure 13. Noteworthy is the decrease in consumption of the residential sector due to the large increases in oil prices during the 1973 to 1979 period.

All of Zimbabwe's oil products are currently being imported. The Feruka Oil Refinery with a capacity of 20 000 barrels per day was constructed in 1964 but was closed in 1966 following the imposition of sanctions after UDI. In 1980 an assessment was made of the cost of rehabilitating the refinery. It was however, decided that the refinery was unsuitable for present conditions since it was designed to process Iranian Light and may now not be able to get a suitable crude for processing. The refinery was also designed for a diesel fuel yield of 58% and 42% gasoline, whilst the current demand was for 72% diesel fuel and 28% gasoline. The total refinery product breakdown compared with the present demand in the country is shown in Table 8.

Table 8. Feruka Refinery design yield and the country demand in 1988

Product	Design yield	Market demand
Gasoline	42,6	23,8
Diesel fuel	30,4	60,3
Kerosene	9,9	0,0
Other	17,1	15,9

As part of the Feruka Refinery, a pipeline was built from Beira in Mozambique to Mutare. Commercial pumping began in 1965 but ceased in 1965 because of the blockade on Rhodesia. It was re-opened as a refined product pipeline in 1982[2]. The pipeline is 288 km long with a diameter of 0,27 metre pipeline, has a pumping station at Beira, and a metering station on the Mozambique/Zimbabwe border. The pipeline was extended to Harare in 1989. It has been subject of sabotage in Mozambique, causing serious shortages. It is however, able to supply all Zimbabwe's needs if it is operated for ten days per month.

5.4 Coal

Coal has been the mainstay of the energy generation industry since the beginning of the century, with an exponential rise in production until 1960, as shown in Figure 14. There was a general decline during the sanctions period from 1965 to 1980. After 1980 coal production has increased rapidly. The largest single market for coal is that for coking coal which represents around 34% of the market. The coal utilization by economic sector has changed significantly in the last 18 years. The largest user of coal in 1971 was industry with 41,9% whilst in 1987, the last year for which a breakdown is available, electricity generation took 53,1%. The breakdown for these two years is shown in Table 9.

Table 9. Coal utilization in percent (%) of total market in 1971 and 1987[4]

Sector	1971	1987
Coking	9,0	16,2
Electricity	17,2	53,1
Industry	41,9	15,1
Railway	18,5	3,7
Agriculture	6,8	6,5
Commerce	6,1	4,3
Residential	0,4	1,1

The railways showed a significant drop in coal demand because of the phasing out of coal-fired locomotives, though moves are now being made to refurbish some coal locomotives because of the rise in petroleum prices.

Zimbabwe has been a significant exporter of coal and especially of coking coal which is in short supply in the surrounding countries. However, exports have been decreasing steadily over the last 20 to 30 years, whilst imports of coal have been rising steadily and have increased substantially since 1986, as shown[4,5] in Figure 15. Most of the export coal has been coking coal to South Africa. For instance in 1980 South Africa took 79% of the export coal in the form of coking coal, with Zaire taking 19% for coking purposes[3]. The other importers were Mozambique and Botswana.

In terms of resource availability Zimbabwe could export more coal. However, the cost of transport by rail to the border of Zimbabwe is high and there are bottle-necks in terms of transport in neighbouring countries and at the ports of Beira and Maputo. Political problems have so far ruled out South Africa as an export port, but with the political developments taking place this may be possible in the future.

The usage of coal for electricity generation has also been increasing since 1985 when more reliance was placed on the Hwange Power Station and problems were being experienced with electricity supply from hydro-stations.

Coke is produced by the Wankie colliery, mainly as a feedstock for the Zimbabwe Iron and Steel Corporation (ZISCO), though some is also exported, mainly to Zaire and Zambia for use on the copper mines. With increasing demand for coke in Zimbabwe, export coal will decline unless the production capacity is increased.

5.5 Electricity

Electricity consumption in Zimbabwe has been increasing steadily since 1935, as shown in Figure 16. The rate of increase has declined since 1975 but appears to be fairly steady at the reduced rate. Prior to 1986 supply was from the ESC, from individual municipalities, and from the Central African Power Corporation. Since 1986 the Zimbabwe Electricity Supply Authority (ZESA) - the successor to ESC - has been responsible for all supply in the country and has taken over the operation of the municipal power stations of Harare, Bulawayo, and Umniati, and the power station at Wankie.

The main generation plant until 1960 was thermal, but during Federation days it was agreed to build a joint power station at Kariba under the control of the Central African Power Corporation. This power station consisted of two components - the North Bank Power Station with four 150 MW sets, and the South Bank Power Station with six generating sets of 111 MW each. Thus the total output of the station was 1266 MW. On the breakup of the Federation Zimbabwe became entitled to half of the output of Kariba which amounted to 633 MW. The remaining 633 MW was the property of Zambia. However Zambia did not need its available capacity and some of it was imported into Zimbabwe.

During the 1970's Zimbabwe was concerned about the over-reliance on imported power and plans were made to provide more indigenous power based on coal. However sanctions prevented their construction. After independence the feeling remained that less reliance should be placed on imports and in view of an increasing demand a thermal power station was started. This plant is situated at Hwange at the coal pit-head and consists of Hwange I commissioned in 1984/85 and Hwange II commissioned in 1986/87. Hwange I consists of four 120 MW sets and Hwange II consists of two 220 MW sets with an overall sent-out capacity of 876 MW.

The sent-out capacity of all power plant is now 1827 MW, of which 633 MW is hydro and 1194 is thermal. In addition there is 51 MW of plant owned and operated by private companies, some of which is available to ZESA. Figure 17 shows the growth of generating capacity from 1945 to the present.

The maximum demand on the ZESA system in 1989 was 1429 MW against an installed available capacity of 1827 MW. However, additional capacity was available from Zambia and from the private companies. No information is available about the imported capacity to supply the maximum demand. Besides imports from Zambia there is also a small import component from South Africa which is supplied to the Beit Bridge area.

Further expansion can take place based on both coal and hydro capacity. The Zimbabwe share of possible hydro developments in the Zambezi Basin (see Section 4.4) is 2515 MW which would more than double its installed capacity. Growth in demand for electricity has been slower than expected. A World Bank estimate of electricity growth in the late 1970's has been over-optimistic, as shown in Figure 18.

Until 1985 most of the electricity supply was based on hydro plant. Since the construction of the Hwange plant there has been a swing to thermal electricity, as shown in Figure 19. This swing to thermal has been hastened by limits on imports from the Zambia due to a fire at Zambia's 900 MW Kafue power station. The Kafue power station is being repaired and at the end of 1990 was producing some two-thirds of its design capacity. However, Zambia has also signed an agreement to supply electricity to Namibia, which will make less capacity available to Zimbabwe.

Zimbabwe and Zambia also agreed in 1990 to undertake a joint feasibility study of the Batoka hydro-electric project. An agreement has also been reached for Zimbabwe to import power from Mozambique from the Cahora Bassa Dam.

The electricity supply by ZESA, and its predecessor ESKOM, is shown in Figure 20 by economic sector[6,7]. This Figure is complicated by the fact that from 1986 ZESA took over the running of the municipal stations. Also the figures for supply to municipalities is made up of both residential and industrial demand. From 1987 this municipal component has been divided into its component fractions. In 1989 the component supply to the various sectors is shown in Table 10.

Table 10. Electricity sales to various classes of consumer in 1989 (percent)

Sector	Sales %
Mining	17,5
Industrial	48,5
Agricultural	8,2
Domestic & Other	25,8

5.6 Ethanol

In 1979 the Government decided to substitute 15% of gasoline with locally produced ethanol[3]. The Triangle Sugar Estate built a plant with an annual capacity of 40 million litres of anhydrous ethyl alcohol and the first additions of ethanol to gasoline took place in 1980. There were proposals to expand ethanol production with a plant at Chisumbanje having a capacity of 128 million litres per year. The 1980 cost of ethanol production was estimated at around

35 Zcents/litre. No figures are available for ethanol production, but on the basis of a 15% blend in gasoline, the 1987 consumption would have been 87 million litres of anhydrous ethyl alcohol.

6. PRICING AND MARKETING

6.1 Oil products

The Zimbabwe Government policy on energy pricing is to pass all costs on to the consumer. Prices are administered by the Ministry for Trade and Industry. Import and transport costs are high.

To maintain stability in petroleum prices the Government has set up a Price Equalization Fund which is used as a pool for under or over-recovery of costs following changes in the imported cost of fuel.

Whilst the policy is to pass on all costs to the consumer the price of petroleum products is controlled individually. The disparity between diesel fuel and gasoline has been increasing and in 1980 it was 17,8 Zcents. This has resulted in a move towards diesel with the resultant imbalance between the two fuels as shown in Figure 12.

6.2 Electricity

Electricity tariffs remained low during the 1960's and 1970 and were based on the investment cost of Kariba which was constructed in the late 1950's. Figure 21 shows the current and real price of electricity on the ZESA system, from which it will be seen that the real price fell by 40% during the 1970's. Since then the price has increased and by 1987 the price was at the 1970 level. The World Bank has recommended that the overall tariff should be increased since the present level does not generate sufficient funding to allow for future development.

ZESA has recognized that there is a problem in the tariffs, not only in the level but also in the complexity of their tariffs. They appointed a firm of UK consultants to advise on the tariff structure and the result has been a reduction of the 64 tariffs which were applicable to 7 tariffs for the various class of consumer.

Distribution and sale of electricity is the responsibility of ZESA and thus under the control of the MIED.

6.3 Coal

The coal price ex-Wankie Colliery is governed by a Coal Price Agreement (CPA) which was signed in 1975 and is due to expire in 1995. Under this agreement a yearly price is agreed based on a return of 12,5% after tax on capital employed. For export sales an additional 5% is allowed. The CPA was amended in 1981 to include reference to changing economic conditions.

Export earnings in excess of the permitted return are used to offset shortfalls in the profits permitted on local sales.

The price of coal to ZESA is also fixed by the Government in line with the 12,5% allowed to Hwange Colliery. However, the price also includes a component as an allowance for discard coal. This implies that the electrical utility is in fact subsidizing the sale of coal to other consumers.

6.4 Fuelwood

There is no control over the price of fuelwood and no control over supply or demand. No allowance is made for resource depletion.

6.5 Ethanol

The price for ethanol was agreed on between the Triangle Sugar Estate and the Government. The final cost of ethanol proved to be higher than the agreed price and the Estate was making efforts in 1982 to have the price increased.

7. DISCUSSION

Zimbabwe has a well developed energy sector, especially the coal and electricity components. However the pricing policy may need investigation if the future

growth of the industry is not to be stunted because of capital shortages. The resource situation in hydro-electricity and coal is adequate for a number of years. Medium-term requirements need to be addressed. At the moment energy interchange is hampered by political problems, especially in relation to South Africa. Given an improved political situation in the region, many lowest-cost concepts are available to provide energy requirements for the future.

8. SOURCES OF INFORMATION

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TABLE A

YEAR	POPULAT Thousands	GROSS DOMESTIC PRODUCT (GDP) at FACTOR COST Million of current national currency					GDP DEFLATOR	CONVERS National currency per US$	GDP PER CAPITA current nat. curr	(at 1980 values)	(at 1980 US$)
		AGRICULTURE	INDUSTRY	Manufacture	SERVICES	TOTAL					
1967	4721	152.0	254	142	339	745	41.1	0.71	157.81	383.96	540.78
1968	4906	125.0	271	152	390	786	40.1	0.71	160.21	399.53	562.72
1969	5099	170.0	322	175	441	933	46.5	0.71	182.98	393.50	554.22
1970	5249	153.0	367	209	491	1011	41.2	0.71	192.61	467.50	658.44
1971	5403	200.0	415	251	553	1168	43.6	0.71	216.18	495.82	698.33
1972	5561	234.0	485	297	617	1336	45.9	0.66	240.24	523.41	793.04
1973	5724	215.0	569	343	666	1450	48.8	0.59	253.32	519.10	879.83
1974	5892	315.0	681	421	795	1791	54.9	0.58	303.97	553.68	954.62
1975	6065	323.0	722	447	857	1902	60.2	0.57	313.60	520.93	913.92
1976	6243	350.0	777	480	937	2064	65.1	0.63	330.61	507.85	806.11
1977	6426	334.0	749	460	986	2069	71.1	0.63	321.97	452.85	718.80
1978	6615	289.0	801	515	1169	2259	78.7	0.68	341.50	433.92	638.12
1979	6809	321.0	1014	625	1315	2650	91.4	0.68	389.19	425.81	626.19
1980	7009	451.0	1248	802	1525	3224	100.0	0.64	459.98	459.98	718.72
1981	7268	640.0	1484	1016	1925	4049	114.5	0.69	557.10	486.55	705.14
1982	7538	669.0	1601	1121	2362	4632	129.1	0.76	614.49	475.98	626.29
1983	7817	544.0	2287	1441	2519	5350	153.4	1.01	684.41	446.16	441.74
1984	8106	748.0	2142	1475	2778	5668	161.1	1.24	699.24	434.04	350.03
1985	8406	1039.0	2763	2043	3004	6806	182.2	1.61	809.66	444.38	276.01
1986	8705	1080.0	3297	2405	3532	7909	207.2	1.67	908.56	438.49	262.57
1987	9001	947.0	3773	2720	3981	8701	227.1	1.66	966.67	425.66	256.42
1988		NA	NA	NA	NA	NA			NA	NA	NA
1989		NA	NA	NA	NA	NA			NA	NA	NA
1990		NA	NA	NA	NA	NA			NA	NA	NA

TABLE 8

YEAR	COMMERCIAL ENERGY FORMS IEA ENERGY - TOTAL FINAL CONSUMPTION -000'S TOE						ENERGY/GDP REAL 85 TOE/ ZIM Million $		TRADIT. ENERGY	TOTAL ENERGY	TRADIT AS % OF	ENERGY/CAPITA TOE/CAPITA		
	COAL	OIL	GAS	HYDRO	ELECT	TOTAL		3-PT MA	000'sTOE	TRAD+COM 000'sTOE	TOTAL %	COMMER	TRAD	TOTAL
1971	1168.3	547.3	0.0	0.0	303.8	2019.4	753.8		1000	3019.4	33.1	0.37	0.19	0.56
1972	1023.6	640.5	0.0	0.0	364.6	2028.7	697.0	753.4	1050	3078.7	34.1	0.36	0.19	0.55
1973	1267.4	713.6	0.0	0.0	423.6	2404.6	809.3	714.2	1101	3505.6	31.4	0.42	0.19	0.61
1974	994.8	625.7	0.0	0.0	455.5	2076.0	636.4	733.7	1130	3206.0	35.2	0.35	0.19	0.54
1975	1102.0	775.8	0.0	0.0	509.3	2387.1	755.5	727.3	1168	3555.1	32.9	0.39	0.19	0.59
1976	1288.8	683.0	0.0	0.0	532.9	2504.6	790.0	782.6	1212	3716.6	32.6	0.40	0.19	0.60
1977	1135.8	671.9	0.0	0.0	527.1	2334.7	802.3	796.0	1243	3577.7	34.7	0.36	0.19	0.56
1978	1088.1	689.0	0.0	0.0	507.2	2284.3	795.8	793.3	1276	3560.3	35.8	0.35	0.19	0.54
1979	1118.4	601.5	0.0	0.0	546.6	2266.5	781.7	784.0	1302	3568.5	36.5	0.33	0.19	0.52
1980	1251.4	648.5	0.0	0.0	597.1	2497.0	774.5	754.5	1362	3859.0	35.3	0.36	0.19	0.55
1981	1173.7	714.0	0.0	0.0	613.8	2501.5	707.4	719.7	1458	3959.5	36.8	0.34	0.20	0.54
1982	1140.9	660.2	0.0	0.0	629.3	2430.3	677.4	702.2	1503	3933.3	38.2	0.32	0.20	0.52
1983	1166.7	750.9	0.0	0.0	599.5	2517.1	721.7	689.4	1492	4009.1	37.2	0.32	0.19	0.51
1984	1069.1	717.9	0.0	0.0	567.3	2354.3	669.2	681.2	1544	3898.3	39.6	0.29	0.19	0.48
1985	1122.2	699.6	0.0	0.0	616.0	2437.8	652.6	673.3	1542	3979.8	38.7	0.29	0.18	0.47
1986	1236.0	783.7	0.0	0.0	645.3	2664.9	698.2	685.7	1703	4367.9	39.0	0.31	0.20	0.50
1987	1330.3	745.6	0.0	0.0	630.6	2706.5	706.4	NA	1709	4415.5	38.7	0.30	0.19	0.49
1988	1466.8	745.7	0.0	0.0	662.2	2874.6	NA	NA	1736	4610.6	37.7	NA	NA	NA
1989	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1990	NA	NA	NA	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA

TABLE C

	COAL PRODUCTION			EXPORT	IMPORT
	TOE	TOE	TCE	TOE	TOE
		5-PT MA			
1930	547.3		939		
1931	342.2		587		
1932	255.3	360.3	438		
1933	282.1	331.9	484		
1934	374.8	345.7	643		
1935	405.1	414.5	695		
1936	410.9	479.8	705		
1937	599.8	535.2	1029		
1938	608.5	604.7	1044		
1939	651.7	687.1	1118		
1940	752.5	749.1	1291		
1941	823.0	834.8	1412		
1942	909.9	915.2	1561		
1943	1037.0	959.3	1779		
1944	1053.9	982.7	1808		
1945	972.8	976.6	1669		
1946	940.2	966.9	1613		
1947	879.0	979.8	1508		
1948	988.6	1033.3	1696		
1949	1118.6	1113.4	1919		
1950	1240.4	1236.0	2128		
1951	1340.6	1343.4	2300		
1952	1491.6	1440.1	2559		
1953	1526.0	1578.5	2618		
1954	1601.8	1724.5	2748		
1955	1932.3	1875.4	3315		
1956	2071.0	1982.3	3553		
1957	2245.9	2100.0	3853		
1958	2060.5	2128.5	3535		
1959	2190.5	2072.5	3758		
1960	2074.5	1952.8	3559		
1961	1791.2	1860.1	3073		
1962	1647.2	1776.9	2826		
1963	1597.1	1771.0	2740		
1964	1774.3	1808.2	3044		
1965	2045.4	1835.5	3509		
1966	1977.2	1897.6	3392		
1967	1783.6	1902.2	3060		
1968	1907.8	1862.8	3273		
1969	1797.0	1818.9	3083		
1970	1848.3	1767.7	3171	NA	NA
1971	1757.7	1731.3	3092	223.9	20.0
1972	1527.7	1715.5	2762	186.3	37.8
1973	1725.7	1652.5	3060	137.4	55.3
1974	1718.3	1660.9	2799	183.2	40.4
1975	1533.2	1674.9	2493	233.6	61.4
1976	1799.5	1638.9		190.3	58.8
1977	1597.8	1609.1		220.5	57.1
1978	1545.5	1642.9		205.6	22.1
1979	1569.5	1573.5		196.6	29.1
1980	1702.3	1549.5		220.1	66.9
1981	1452.6	1534.5		135.7	45.9
1982	1477.8	1545.7		123.8	51.3
1983	1470.5	1574.3		157.9	35.2
1984	1625.4	1706.9		173.3	56.6
1985	1845.0	1917.7		138.2	57.7
1986	2115.6	2164.8		113.4	145.7
1987	2532.0	2532.0		52.0	378.6
1988	2706.0	2706.0		36.9	453.3

TABLE D

TOTAL COUNTRY

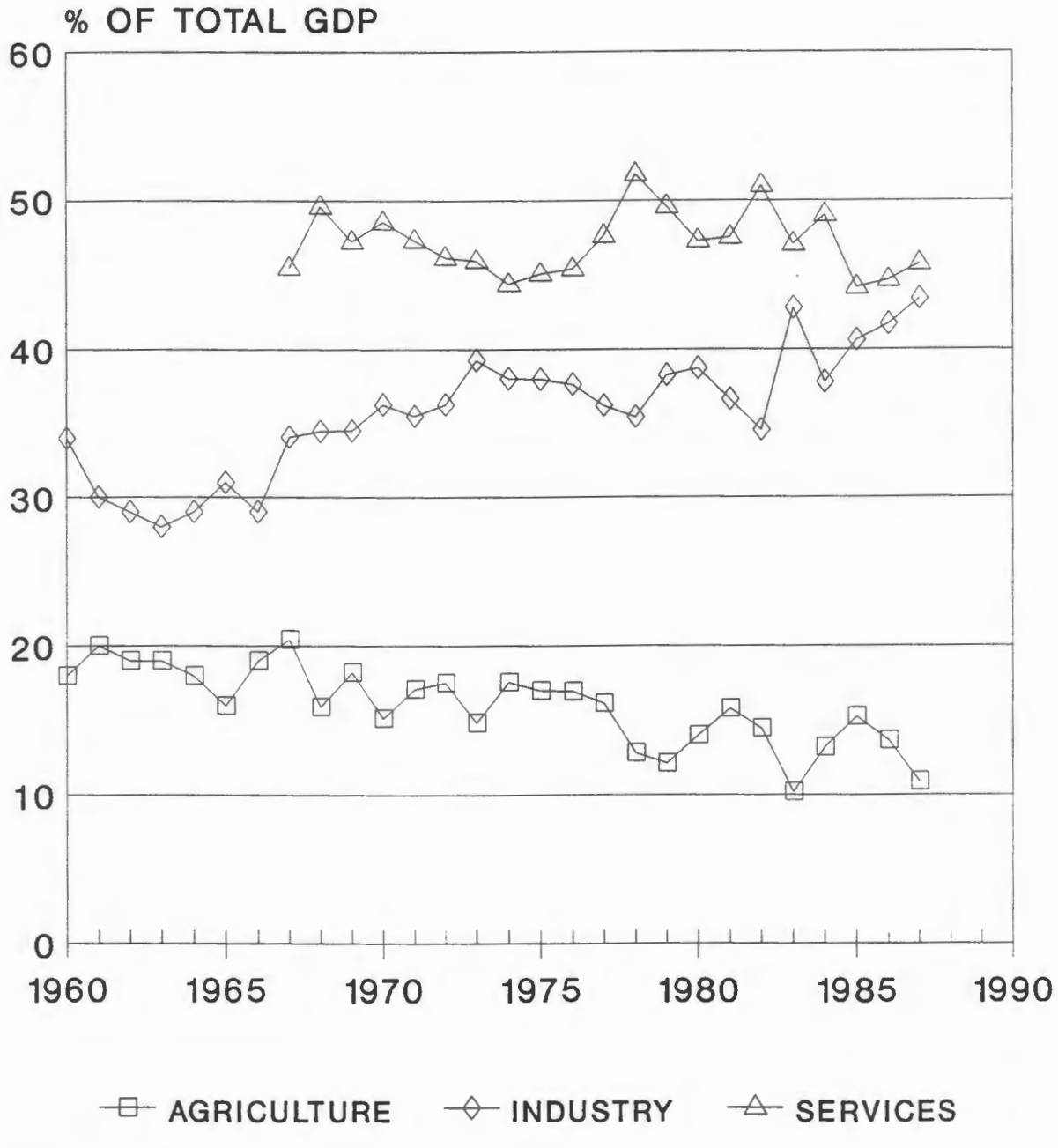
	ZESA SALES Million kWh						MAXIMUM DEMAND	AVE PRICE	DEFLATOR	REAL(80) PRICE	FINAL CONSUMP	
	MINING	INDUST	MUNIC	AGRIC	DOMES+OTH	TOTAL	MW	c/kWh		c/kWh	000'sTOE	Mill kWh
1937	0	0	142	0	0	142						
1938	NA	NA	NA	NA	NA	NA						
1939	NA	NA	NA	NA	NA	NA						
1940	NA	NA	NA	NA	NA	NA						
1941	NA	NA	NA	NA	NA	NA						
1942	87090	5692	10239	0	916	103937						
1943	NA	NA	NA	NA	NA	NA						
1944	NA	NA	NA	NA	NA	NA						
1945	NA	NA	NA	NA	NA	NA						
1946	NA	NA	NA	NA	NA	NA						
1947	107177	12304	14899	0	4080	138460						
1948	123780	20125	29806	2146	5871	181728						
1949	140383	27945	44713	4291	7663	224995						
1950	156986	35766	59620	6437	9454	268263						
1951	173589	43586	74527	8582	11246	311530						
1952	190192	51407	89434	10728	13037	354798						
1953	209219	74759	90597	15665	17448	407687						
1954	228245	98110	91759	20602	21859	460576						
1955	247272	121462	92922	25538	26271	513464						
1956	266298	144813	94084	30475	30682	566353						
1957	285325	168165	95247	35412	35093	619242						
1958	295369	173998	103447	40716	39026	652557						
1959	305413	179832	111647	46021	42958	685871						
1960	315458	185665	119847	51325	46891	719186						1513600
1961	325502	191499	128047	56630	50823	752500		1.046				1562000
1962	335546	197332	136247	61934	54756	785815		1.075				1600900
1963	351555	230644	136686	67377	61483	847745						1722000
1964	367564	263956	137125	72820	68210	909675						1897200
1965	383574	297268	137563	78264	74936	971605						2028900
1966	399583	330580	138002	83707	81663	1033535						2076400
1967	415592	363892	138441	89150	88390	1095465			41.1			2262500
1968	424939	591940	146325	111586	96973	1371763			40.1			2595700
1969	488799	686700	157761	109639	103808	1546707		0.908	46.5	2.0		2895200
1970	594653	803892	161161	143675	120318	1823699		0.883	41.2	2.1		3332700
1971	673688	911528	166996	156606	133292	2042110		0.855	43.6	2.0	303.8	3524080
1972	753965	1050188	184077	175393	150734	2314357		0.853	45.9	1.9	364.6	4229360
1973	867348	1719470	198215	251012	162264	3198309		0.748	48.8	1.5	423.6	4913760
1974	947728	1945038	215004	194489	178566	3480825		0.722	54.9	1.3	455.5	5283800
1975	989840	2273107	229995	251903	198338	3943183		0.752	60.2	1.2	509.3	5907880
1976	1089746	2475548	240530	297174	219579	4322577		0.819	65.1	1.3	532.9	6181640
1977	1235852	2427824	226289	328690	227501	4446156	652	0.941	71.1	1.3	527.1	6114360
1978	1237783	2103485	221377	326848	238724	4128217	620	1.102	78.7	1.4	507.2	5883520
1979	1148899	2085066	229602	396512	246887	4106966	596	1.265	91.4	1.4	546.6	6340560
1980	1247245	2575427	255039	384801	254133	4716645	676	1.247	100	1.2	597.1	6926360
1981	1301613	2685824	275526	350593	282748	4896304		1.431	114.5	1.2	613.8	7120080
1982	1315638	2713566	283930	478482	322165	5113781		1.559	129.1	1.2	629.3	7299880
1983	1255456	2462286	288273	523101	346056	4875172		2.136	153.4	1.4	599.5	6954200
1984	1199978	2510053	282822	425866	365264	4783983		2.790	161.1	1.7	567.3	6580680
1985	1216890	2751943	271538	389705	394026	5024102		3.443	182.2	1.9	616.0	7145600
1986	1362542	2960147	2633466	500942	426033	7883130	1274	4.320	207.2	2.1	645.3	7883130
1987	1435204	3933302	0	683333	1945525	7997364	1342	4.663	227.1	2.1	630.6	7997364
1988	1472734	3980295	0	613393	2046191	8112613	1406	5.064			662.2	8112613
1989	1499075	4150088	0	697648	2204509	8551320	1429	5.491			NA	8551320

TABLE E

******** INSTALLED CAPACITY - MW ********

	*** PUBLIC ***			* SELF PRODUCE *		*** TOTAL ***		
	HYDRO	THERMAL	TOTAL	HYDRO	THERMAL	HYDRO	THERMAL	TOTAL
1945		13	13			0	13	13
1946		140	140			0	140	140
1947		253	253			0	253	253
1948		367	367			0	367	367
1949		367	367			0	367	367
1950		367	367			0	367	367
1951		367	367			0	367	367
1952		367	367			0	367	367
1953		367	367			0	367	367
1954		367	367			0	367	367
1955		367	367			0	367	367
1956		367	367			0	367	367
1957		367	367			0	367	367
1958		367	367			0	367	367
1959		367	367			0	367	367
1960	211	367	578			211	367	578
1961	422	367	789			422	367	789
1962	633	367	1000			633	367	1000
1963	633	367	1000			633	367	1000
1964	633	367	1000		37	633	404	1037
1965	633	367	1000		40	633	407	1040
1966	633	367	1000		50	633	417	1050
1967	633	367	1000		51	633	418	1051
1968	633	367	1000		51	633	418	1051
1969	633	367	1000		51	633	418	1051
1970	633	367	1000		51	633	418	1051
1971	633	367	1000		51	633	418	1051
1972	633	367	1000		51	633	418	1051
1973	633	367	1000		51	633	418	1051
1974	633	367	1000		51	633	418	1051
1975	633	367	1000		51	633	418	1051
1976	633	367	1000		51	633	418	1051
1977	633	367	1000		51	633	418	1051
1978	633	367	1000		51	633	418	1051
1979	633	367	1000		51	633	418	1051
1980	633	367	1000		51	633	418	1051
1981	633	367	1000		51	633	418	1051
1982	633	367	1000		51	633	418	1051
1983	633	367	1000		51	633	418	1051
1984	633	690	1323		51	633	741	1374
1985	633	690	1323		51	633	741	1374
1986	633	798	1431		51	633	849	1482
1987	633	1194	1827			633	1194	1827
1988	633	1194	1827			633	1194	1827
1989	633	1194	1827			633	1194	1827
1990	633	1194	1827			633	1194	1827

FIGURE 1. GDP COMPONENTS AGRICULTURE, INDUSTRY AND SERVICES.



118/ZIMCOMP

FIGURE 2. REAL GDP (1980) PER CAPITA - AT FACTOR PRICE

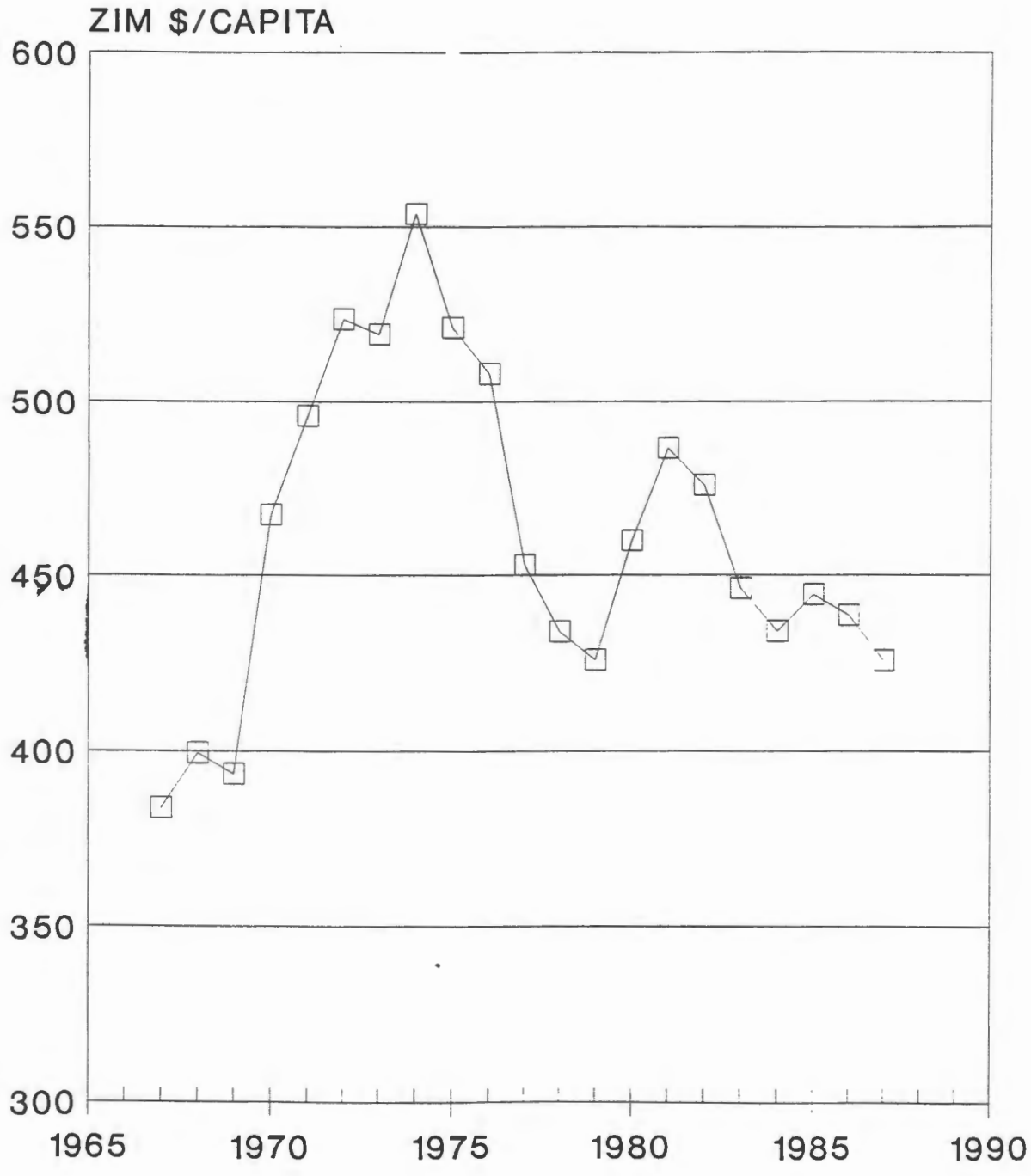
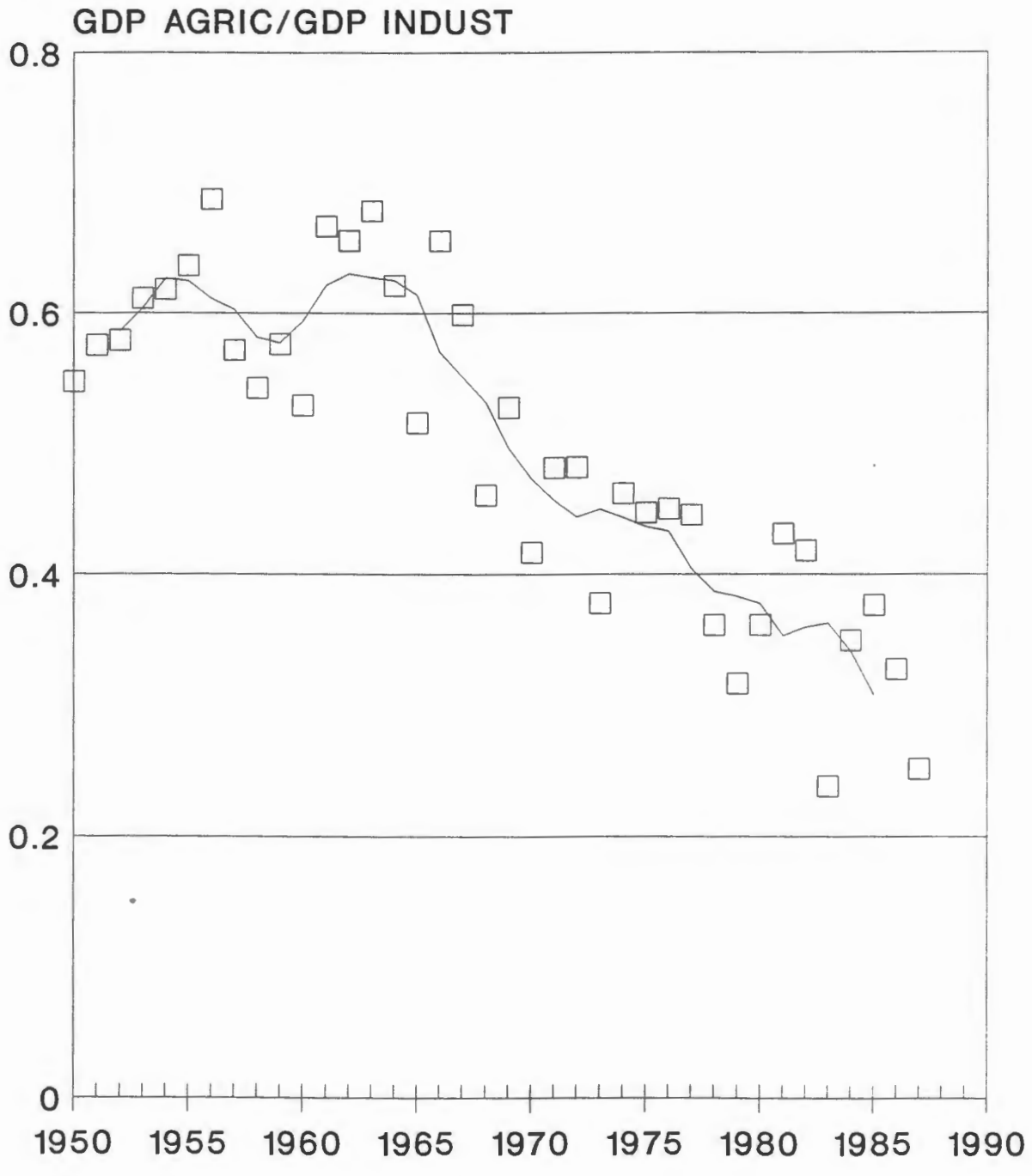
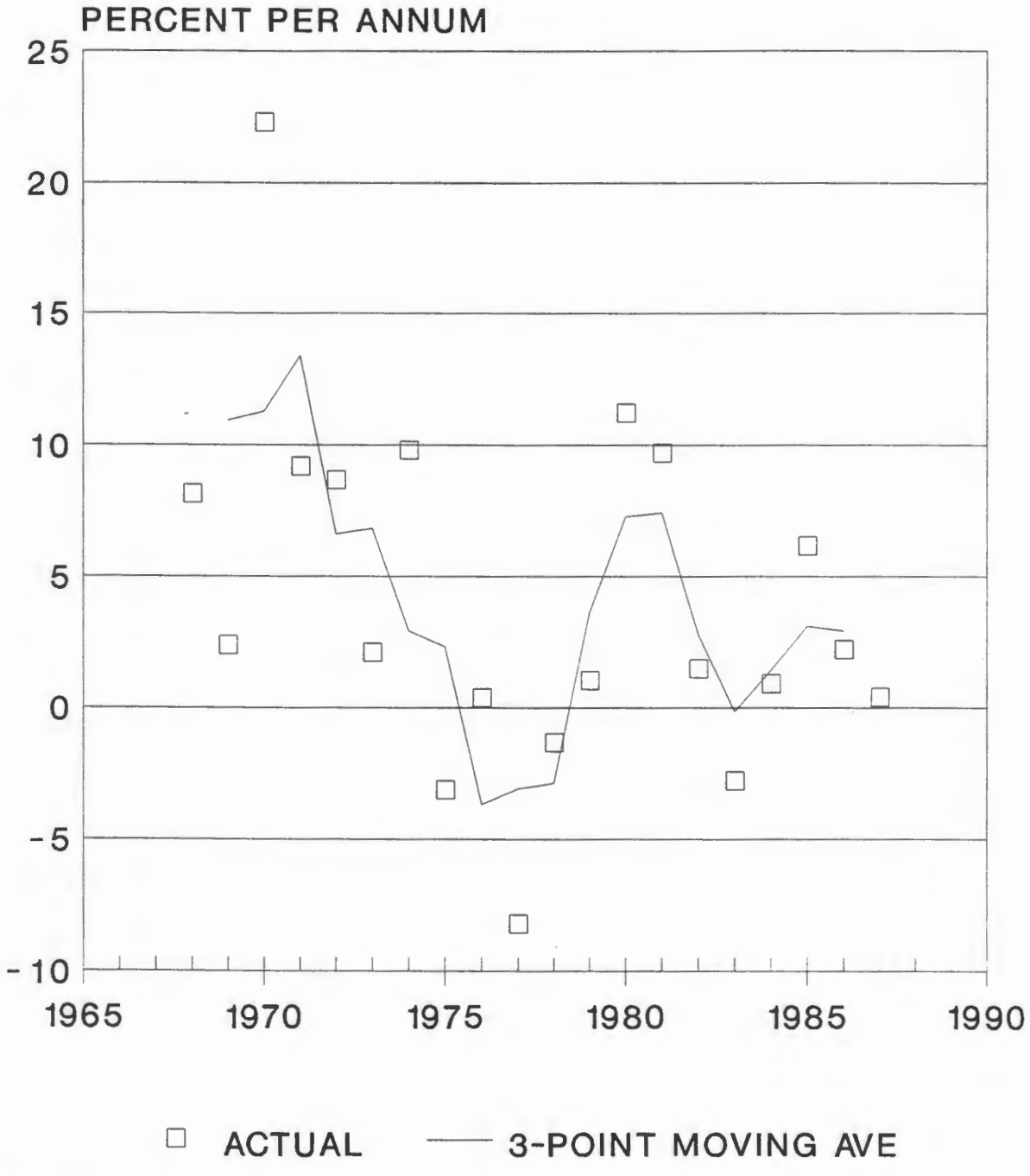


FIGURE 3. RATIO OF GDP'S OF AGRICULTURE AND INDUSTRY



118/ZIMCOMPS

FIGURE 4. GDP GROWTH RATE (REAL-1980) IN PERCENT PER ANNUM



118/ZIMCOMPS

FIGURE 5. FINAL ENERGY CONSUMPTION BY FUEL TYPE - 1986

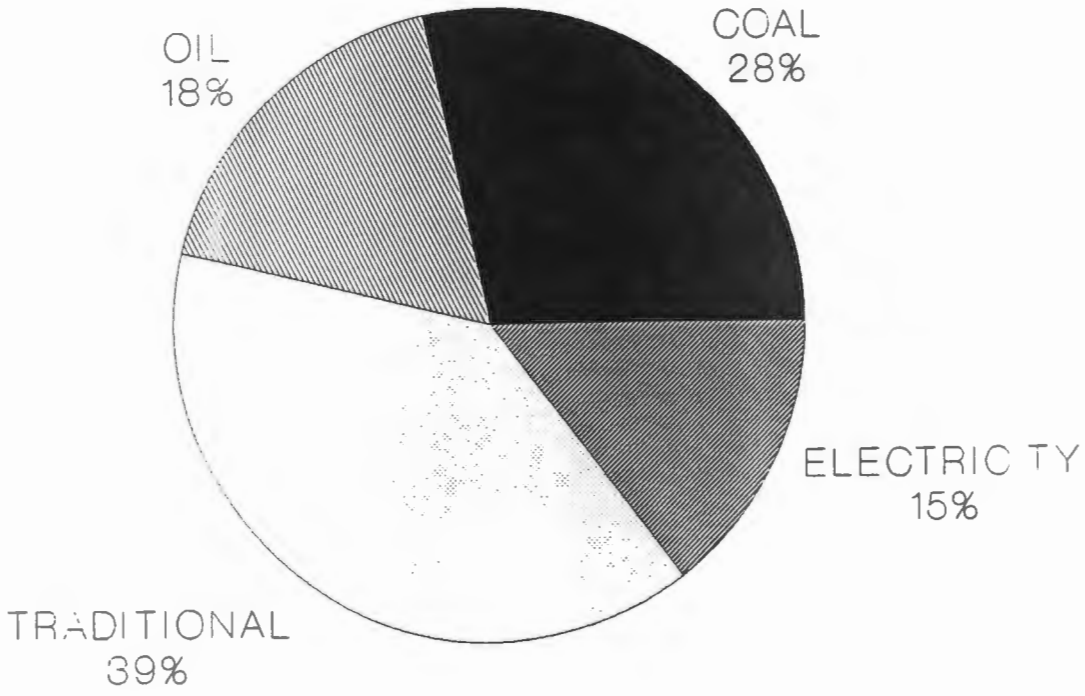
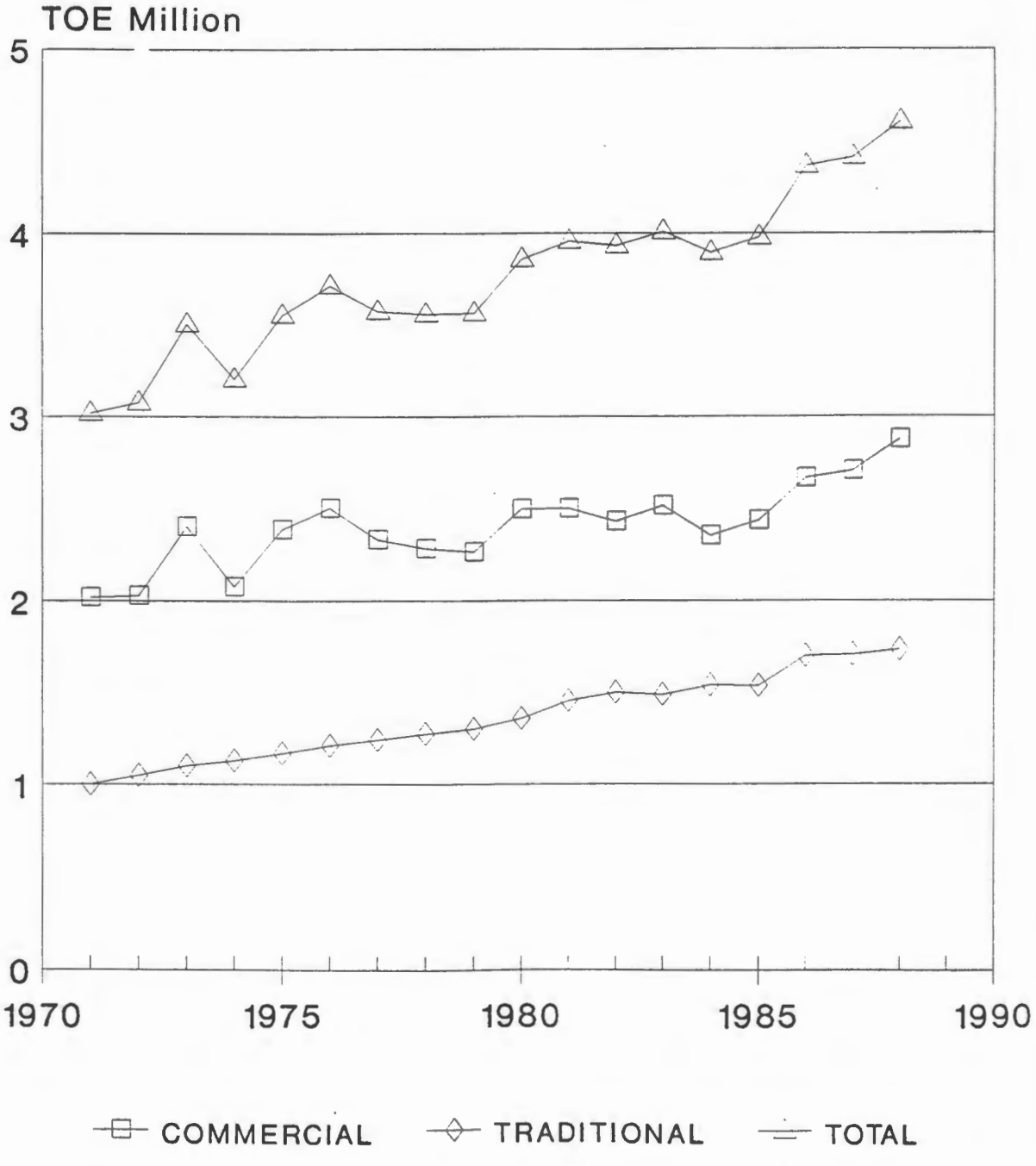
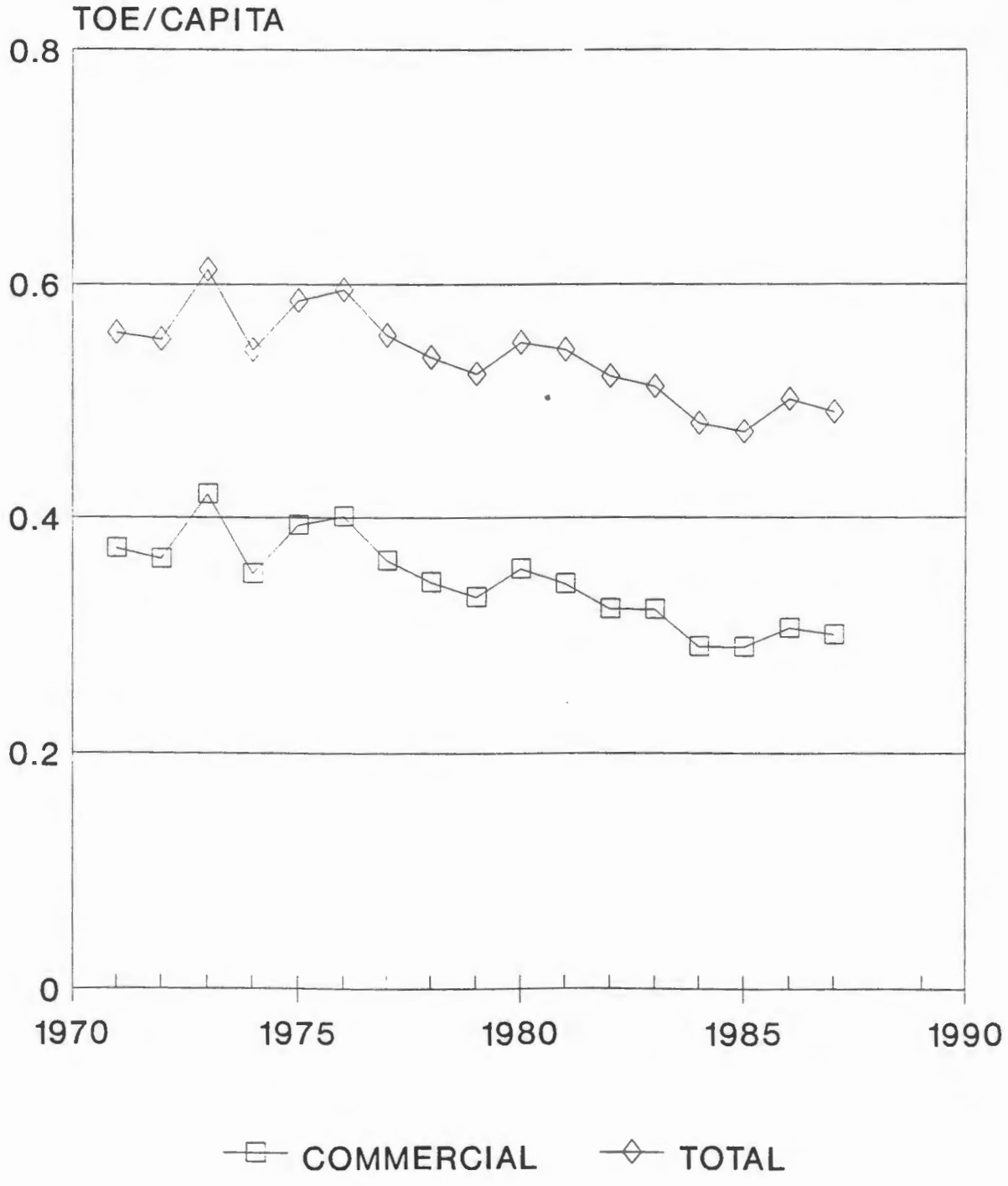


FIGURE 6. FINAL ENERGY CONSUMPTION COMMERCIAL AND TRADITIONAL



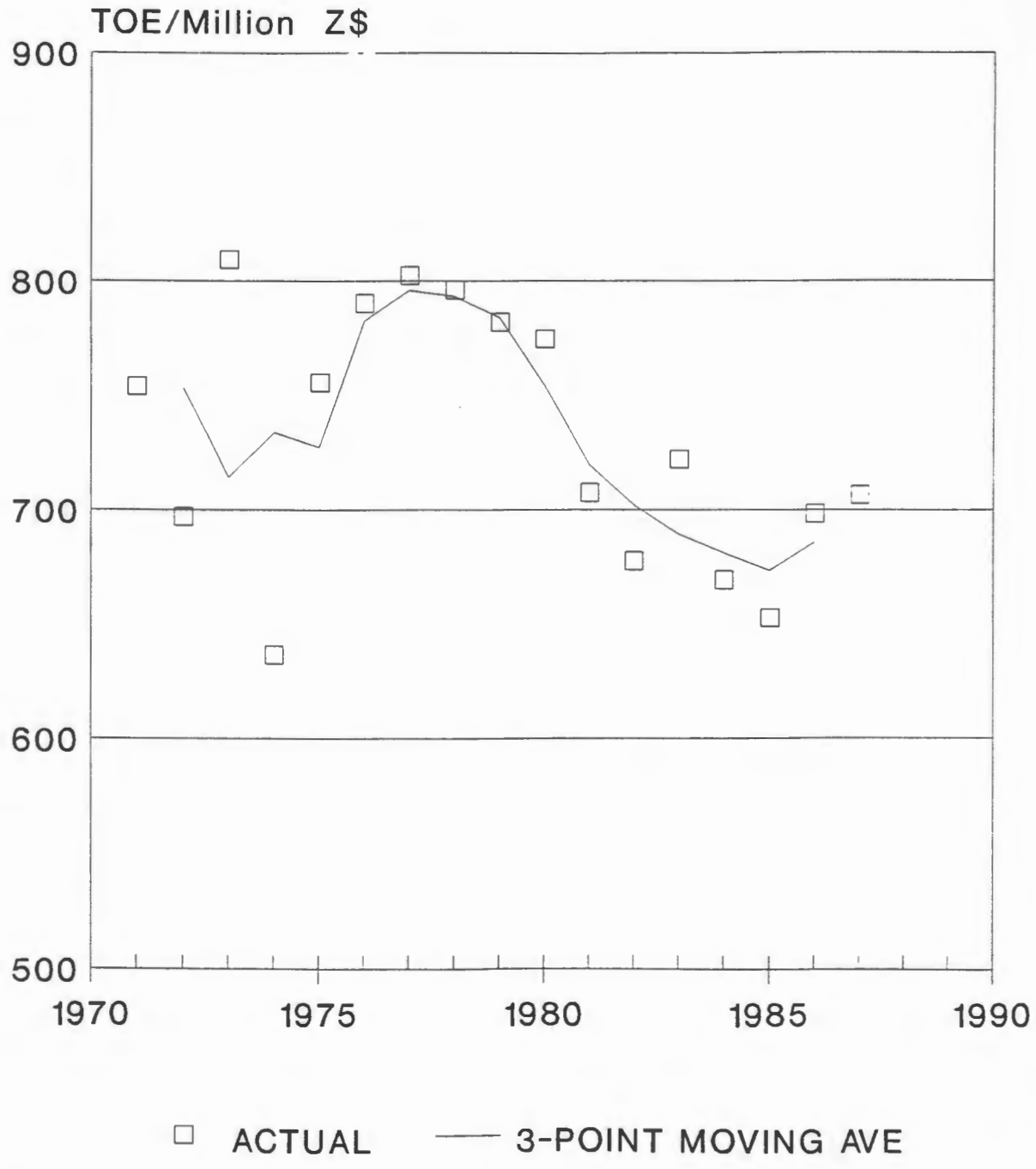
118/ZIMCOMPS

FIGURE 7. FINAL ENERGY USAGE PER CAPITA



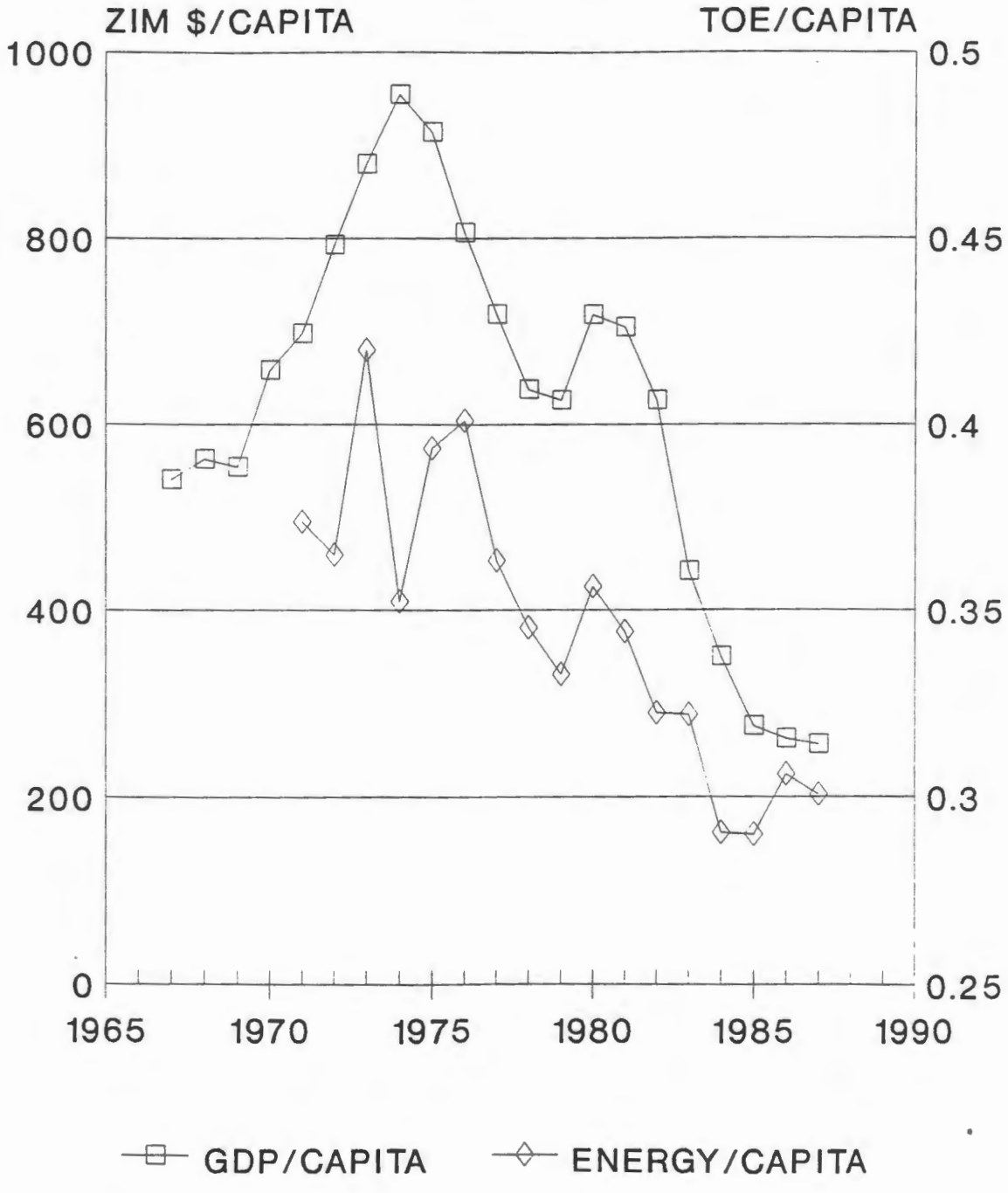
118/ZIMCOMPS

FIGURE 8. ENERGY INTENSITY
TOE/GDP Million Z$ (1980)



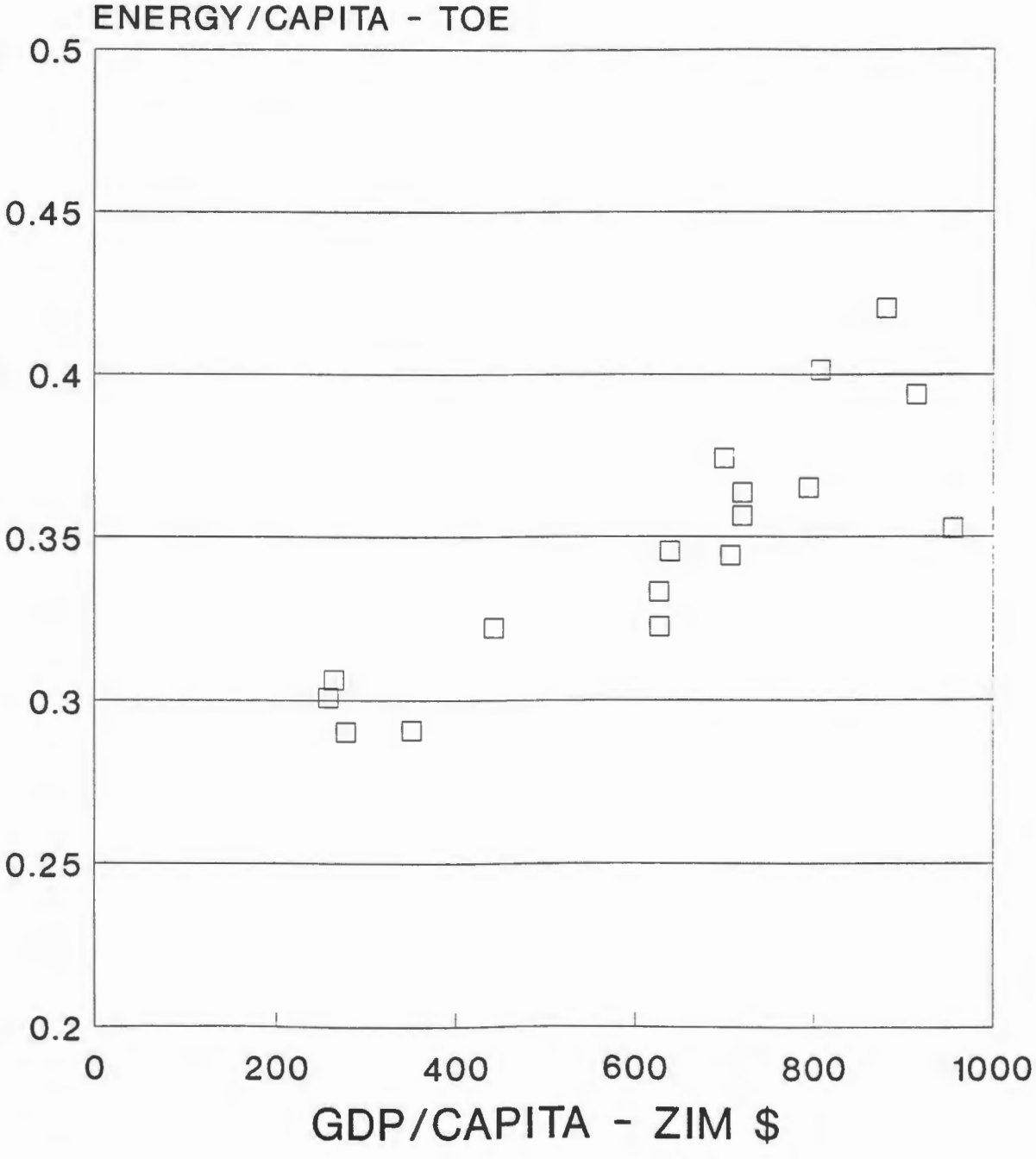
118/ZIMCOMPS

FIGURE 9. REAL GDP(1980) PER CAPITA AND ENERGY PER CAPITA



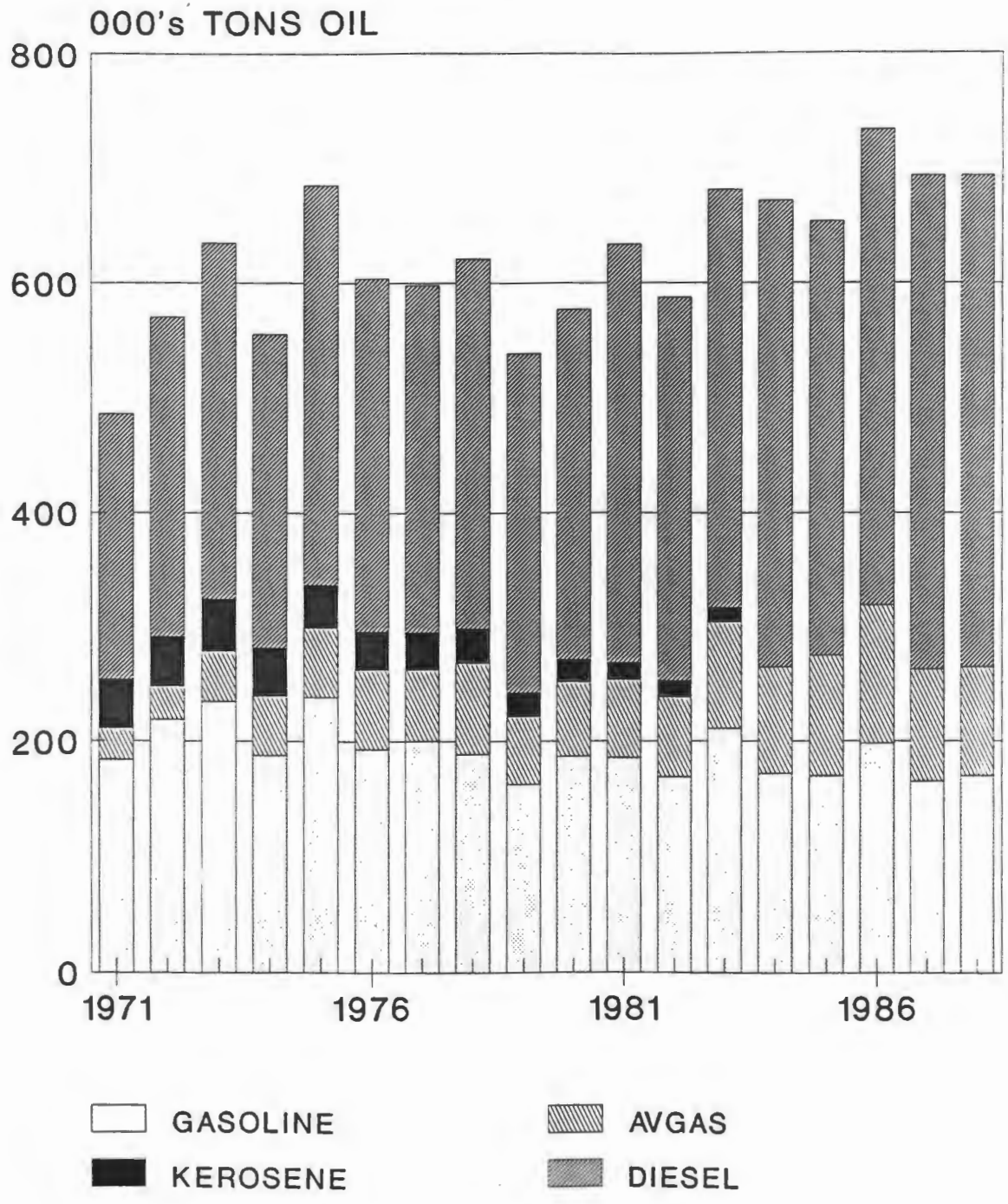
118/ZIMCOMPS

FIGURE 10. RELATIONSHIP BETWEEN GDP PER CAPITA (1980 Z$) AND ENERGY PER CAPITA



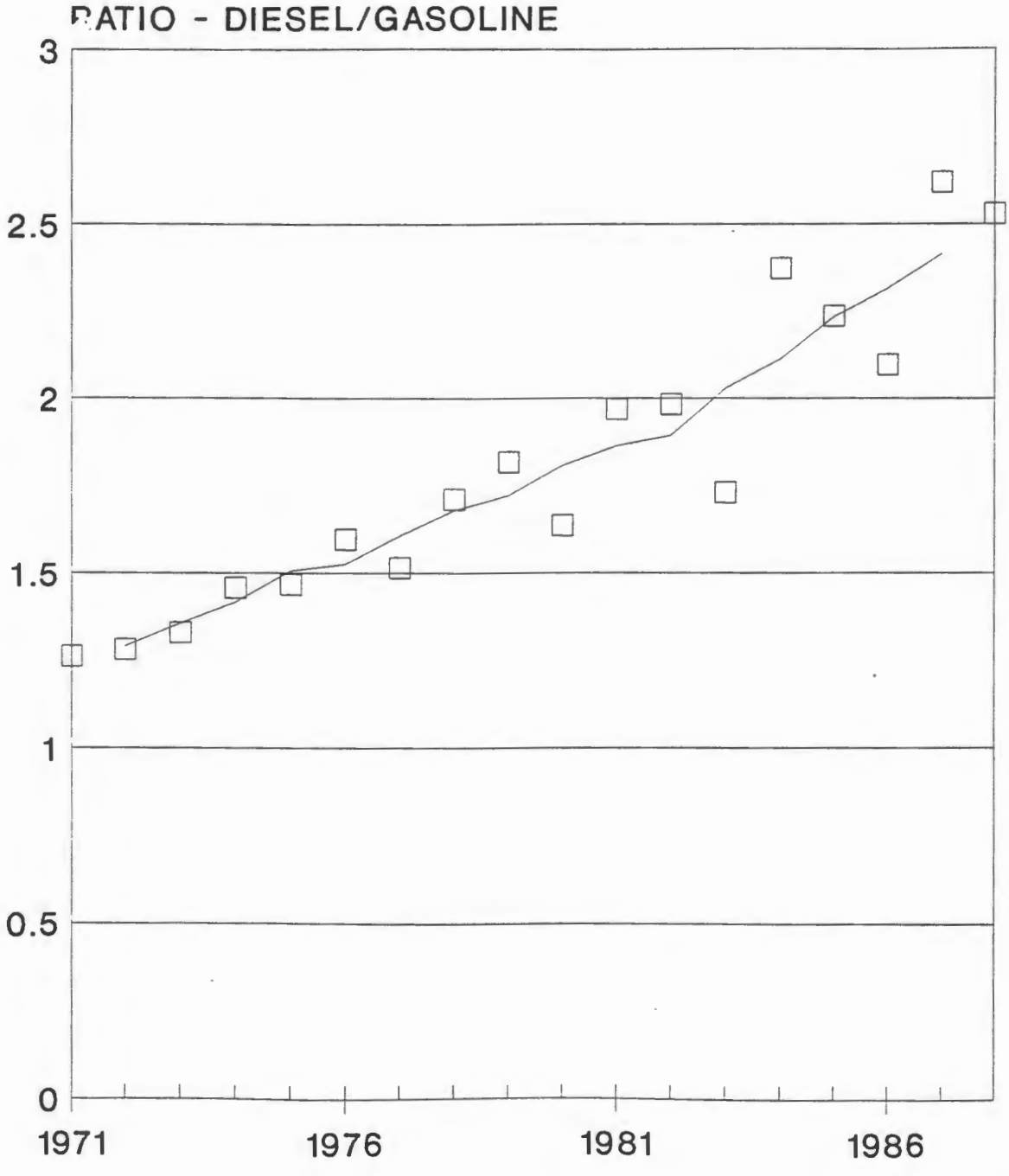
118/ZIMCOMP

FIGURE 11. OIL PRODUCT CONSUMPTION



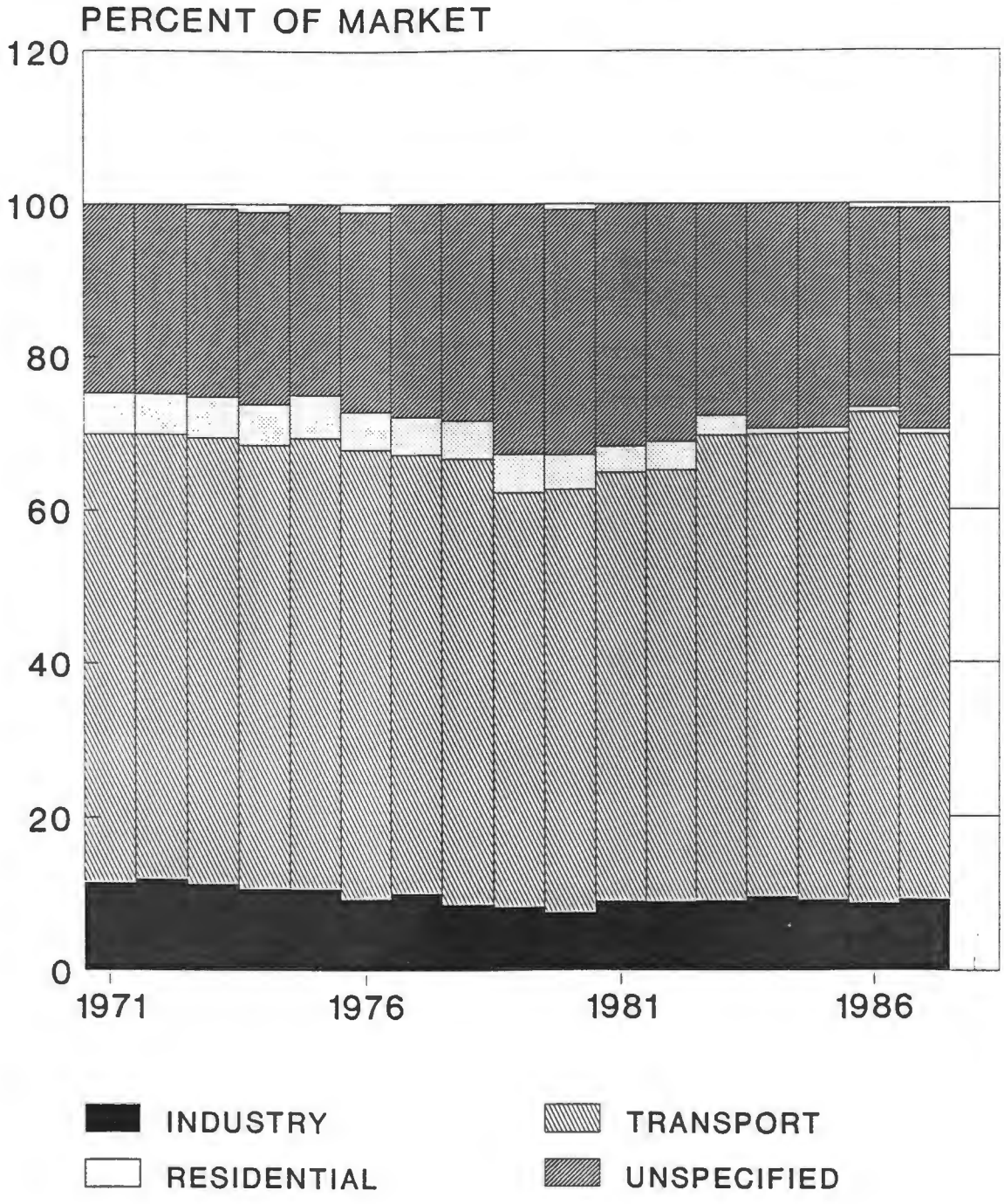
-133/ZIM_OIL

FIGURE 12. RATIO OF DIESEL FUEL CONSUMPTION TO GASOLINE CONSUMPTION



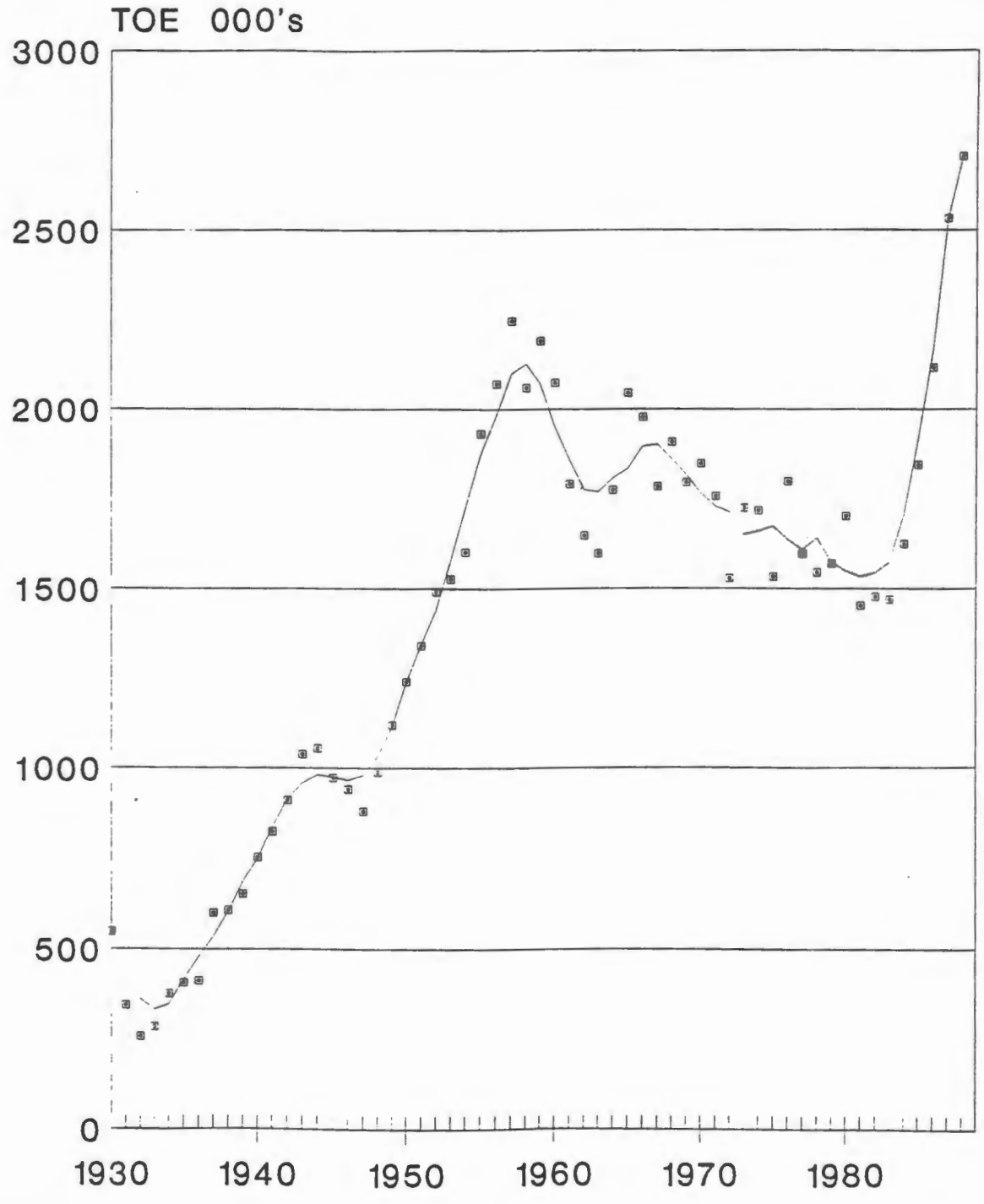
133/ZIM_OIL

FIGURE 13. OIL PRODUCT USAGE BY SECTOR



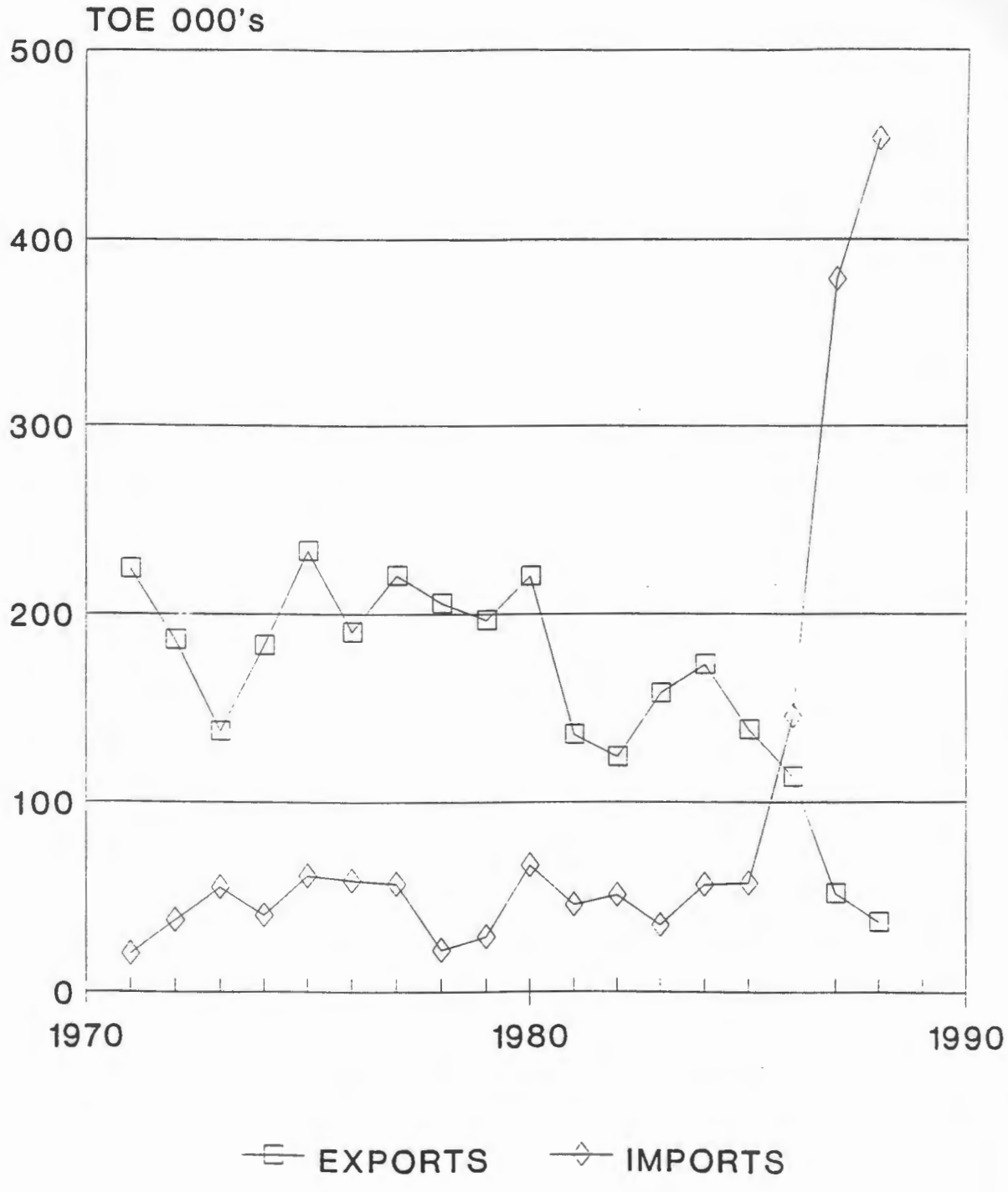
133/OSECZIM

FIGURE 14. COAL PRODUCTION



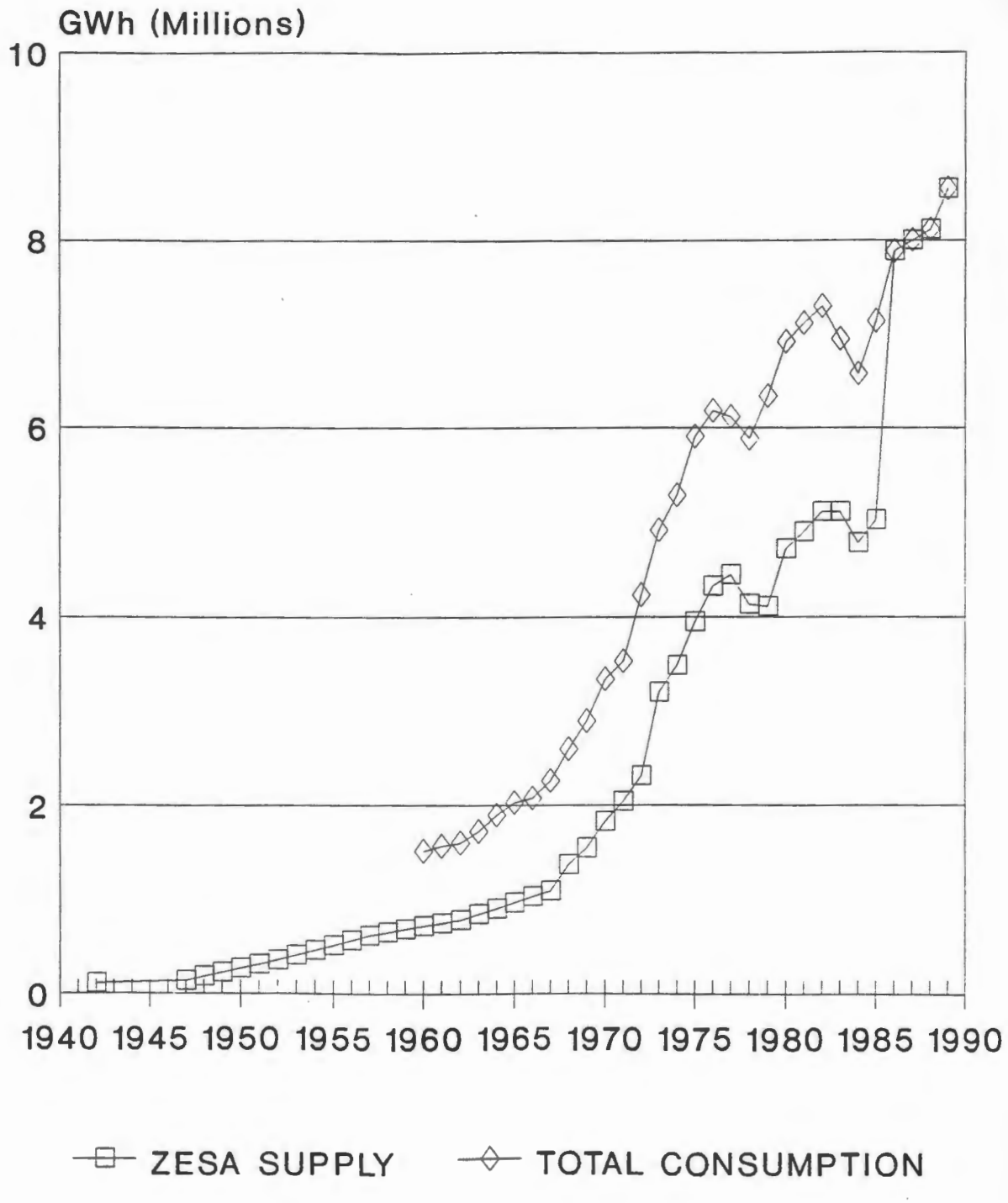
118/ZIMCOAL

FIGURE 15. COAL EXPORTS AND IMPORTS



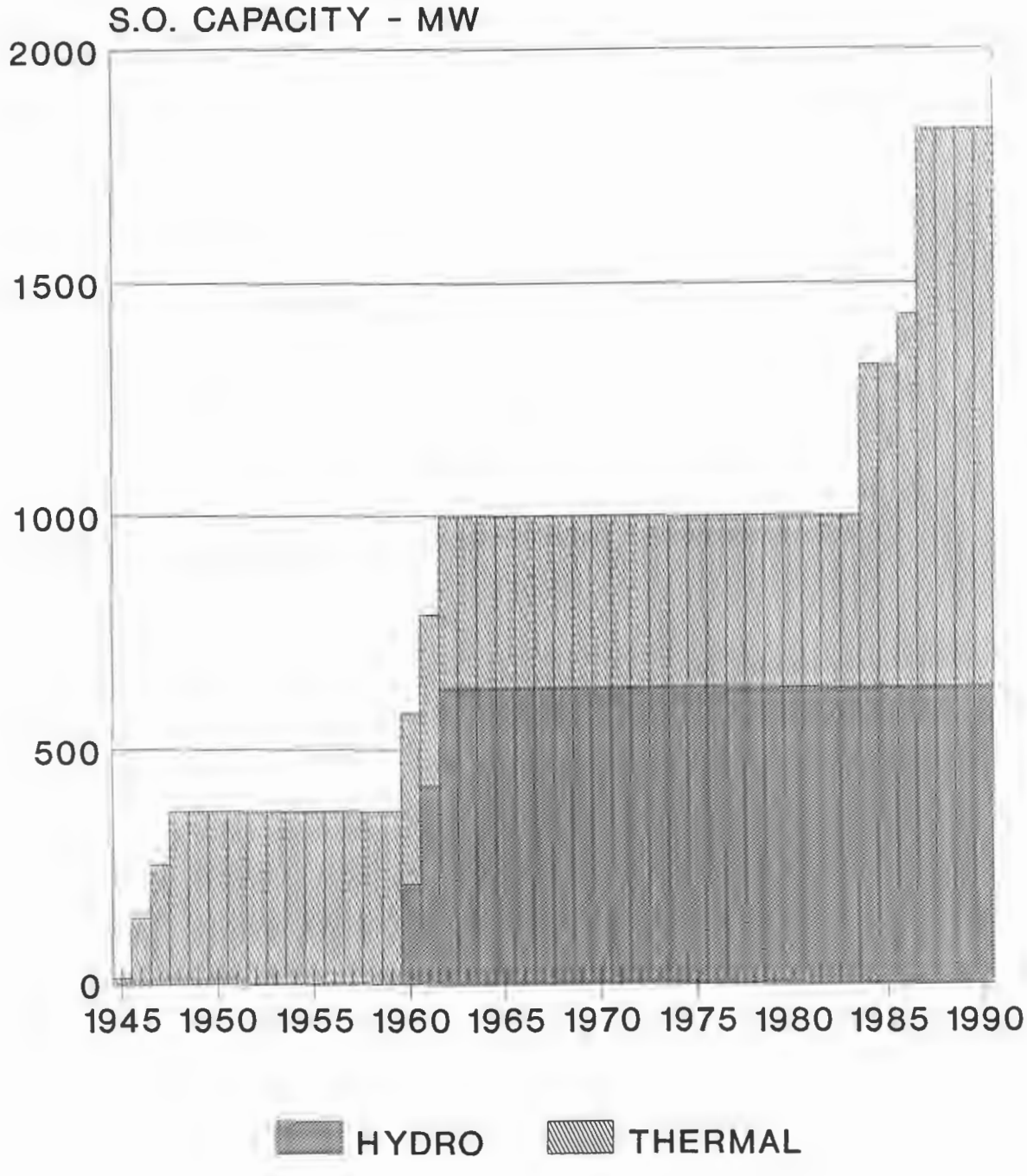
118/ZIMCOAL

FIGURE 16. ELECTRICITY CONSUMPTION



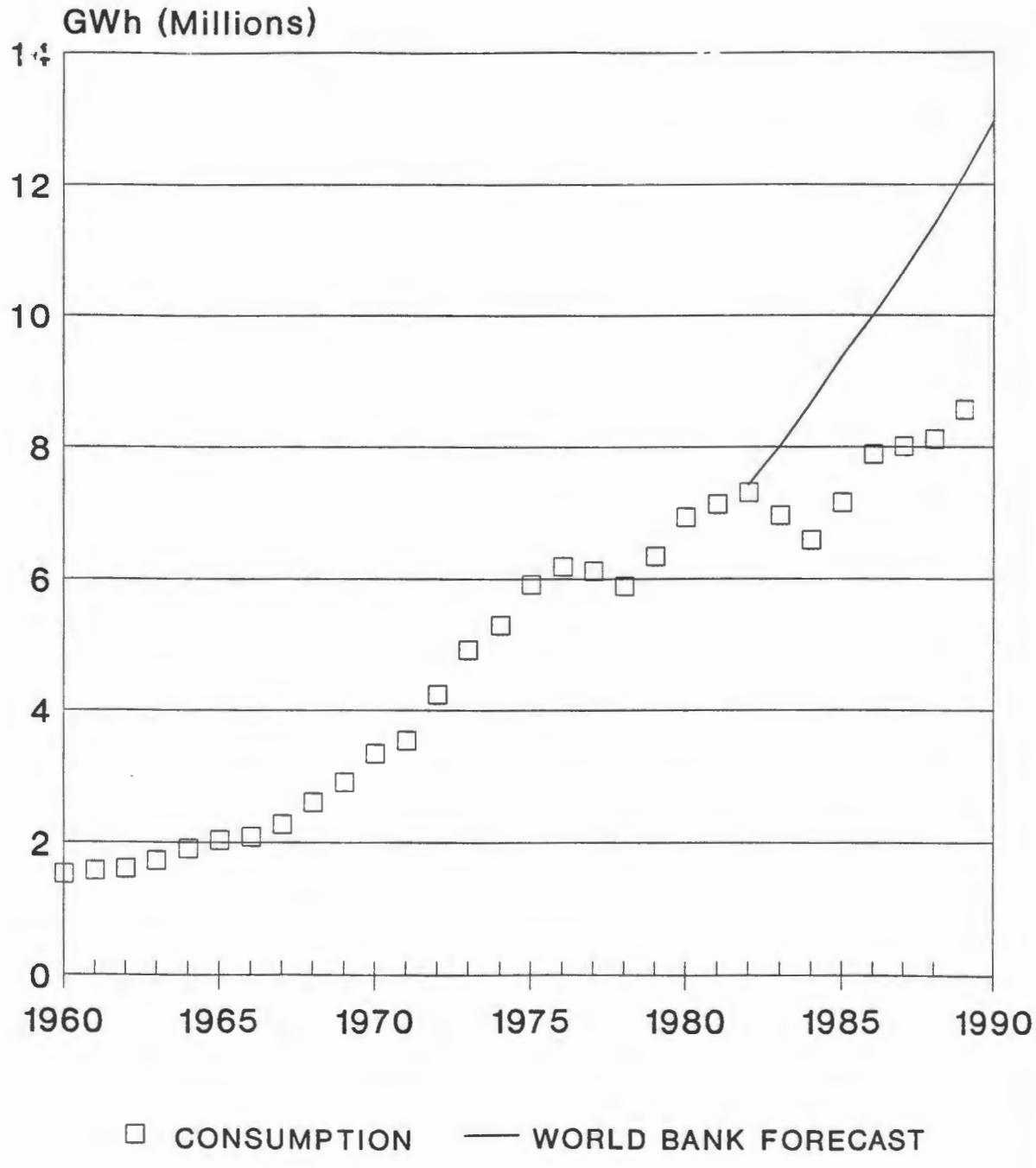
118/ZIMELEC

FIGURE 17. ELECTRICAL CAPACITY ON A SENT-OUT BASIS



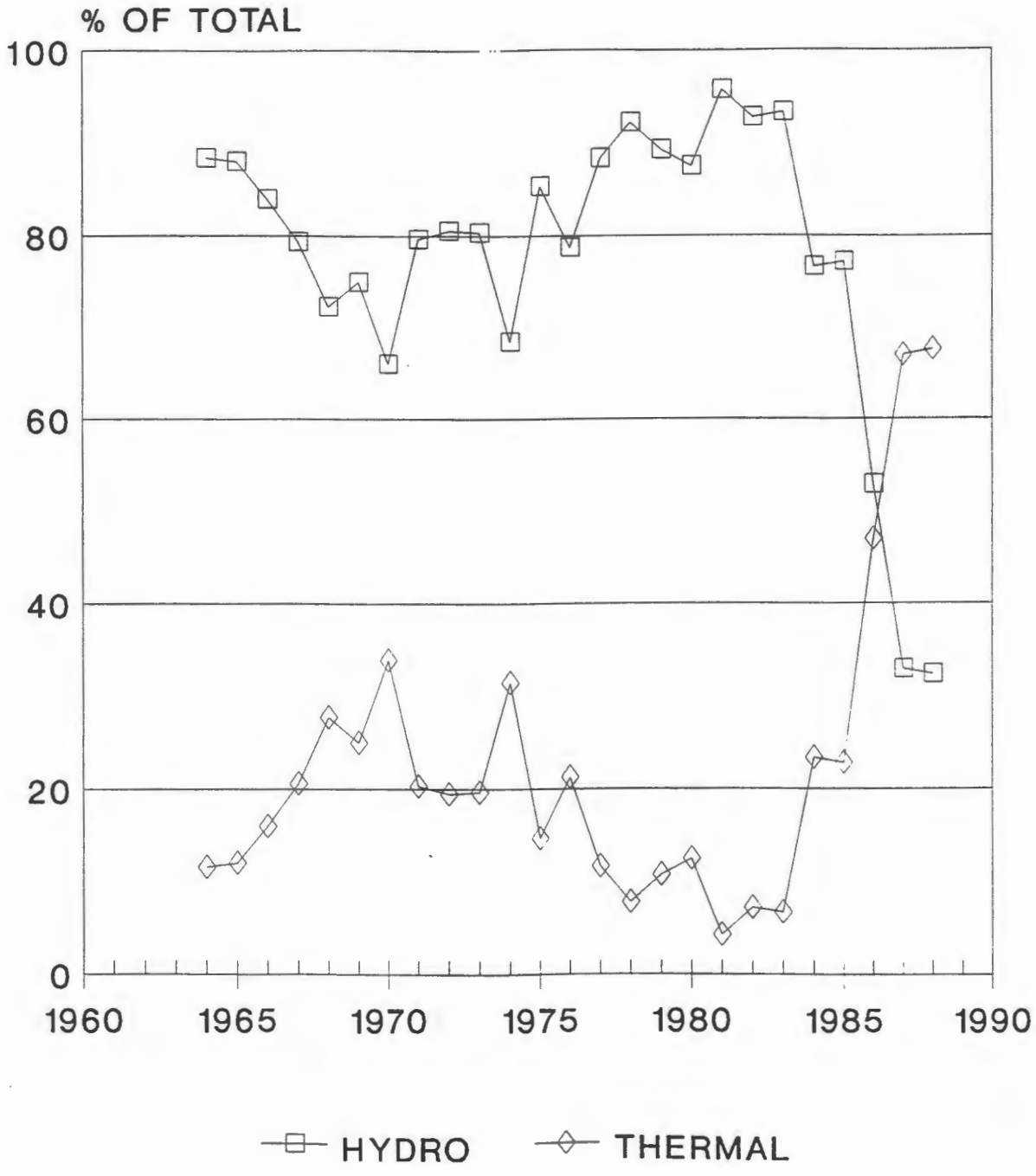
118/ZIMELEC

FIGURE 18. ELECTRICITY CONSUMPTION ACTUAL AND FORECAST



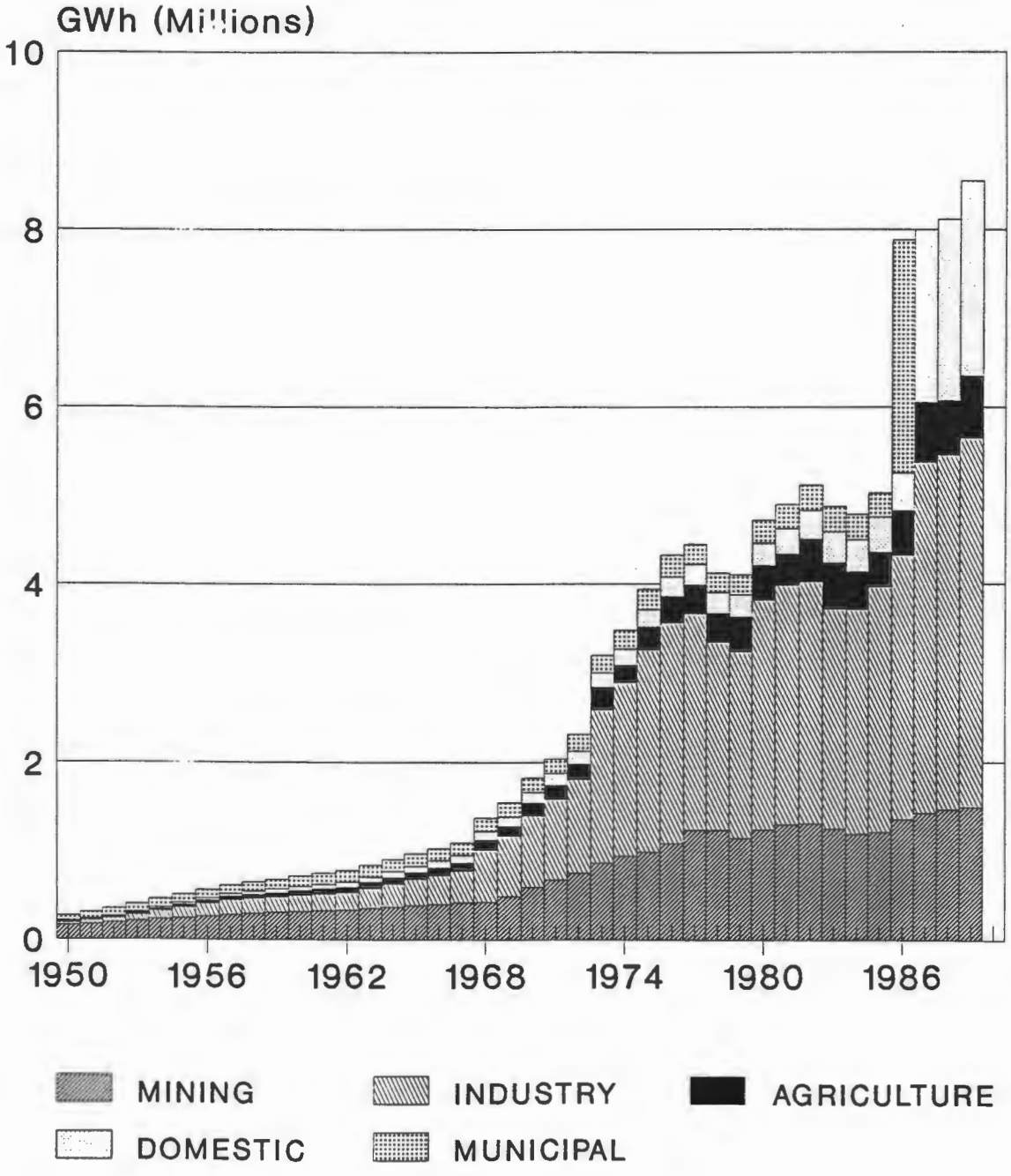
118/ZIMELEC

FIGURE 19. ELECTRICITY SUPPLY BY SOURCE HYDRO AND THERMAL



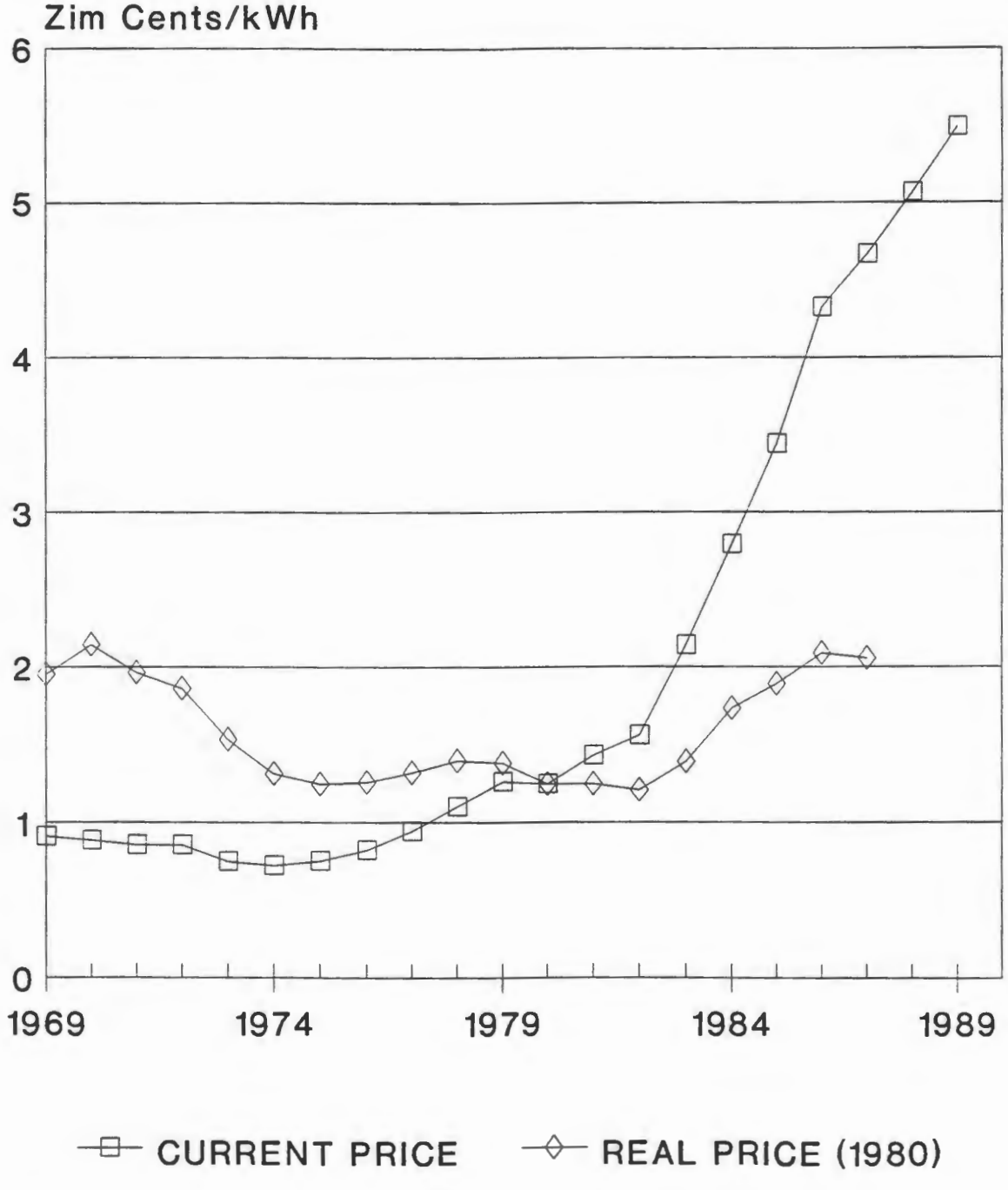
118/ZIMELEC

FIGURE 20. ELECTRICITY CONSUMPTION BY VARIOUS SECTORS - ZESA.



118/ZIMELEC

FIGURE 21. AVERAGE PRICE OF ELECTRICITY CURRENT AND REAL PRICE



118/ZIMELEC


IBRD 15480R
JUNE 1982
ZIMBABWE
ZAMBIA
MOZAMBIQUE
BOTSWANA
SOUTH AFRICA
NAMIBIA
MASHONALAND WEST
MASHONALAND CENTRAL
MASHONALAND EAST
MATABELELAND NORTH
MATABELELAND SOUTH
MIDLANDS
MANICALAND
VICTORIA
HARARE
Victoria Falls
Wankie
Bulawayo
Plumtree
To Mafeking, South Africa
Gwanda
West Nicholson
Beitbridge
Chicualacuala (Malvernia)
Zawi
Sinoia
Binduro
Shamva
Cheguto
Garooma
Que Que
Redcliff
Gweru
Umvuma
Marondellas
Mutare
Nyanda
Inyazombi
Odzi
Sabi
Shabani
Kyle Dam
Lundi
Nuanetsi
Limpopo
Shashe
Nata
Gwayi
Shangani
Gwelo
Hunyani
Ruya
Mazoe
Hard Surfaced Roads
Loose or Unsurfaced Roads
Railroads
Airfields
Rivers
Province Boundaries
International Boundaries
N
KILOMETERS 0 50 100 150
MILES 0 50 100
16°
18°
20°
22°
26°
28°
30°
32°
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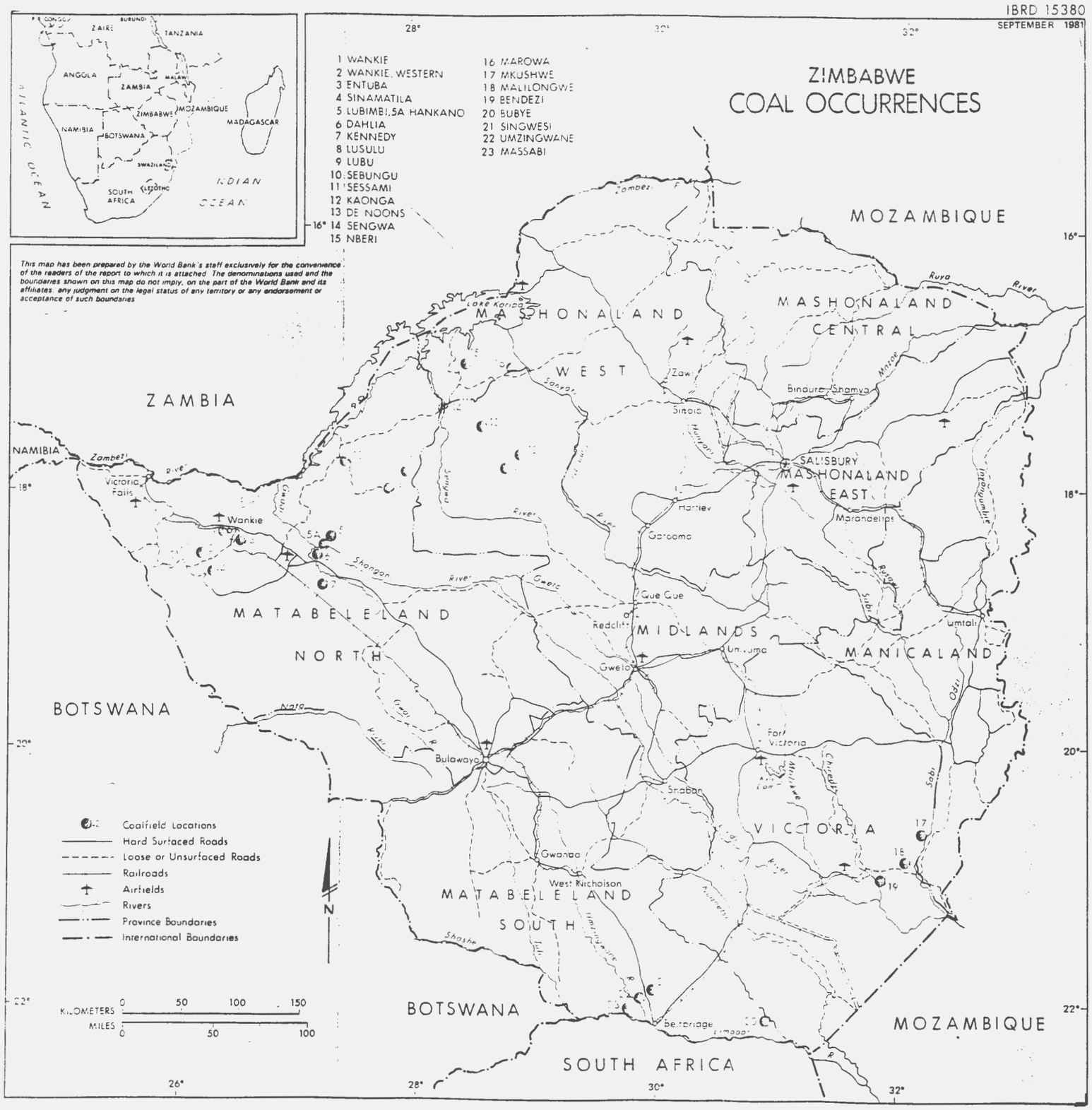
CONGO
ZAIRE
BURUNDI
TANZANIA
SEYCHELLES
COMOROS
ANGOLA
MALAWI
ZAMBIA
MOZAMBIQUE
ZIMBABWE
MADAGASCAR
NAMIBIA
BOTSWANA
SWAZILAND
LESOTHO
SOUTH AFRICA
INDIAN OCEAN


IBRD 15380
SEPTEMBER 1981
ZIMBABWE
COAL OCCURRENCES
1 WANKIE
2 WANKIE, WESTERN
3 ENTUBA
4 SINAMATILA
5 LUBIMBI,SA HANKANO
6 DAHLIA
7 KENNEDY
8 LUSULU
9 LUBU
10 SEBUNGU
11 'SESSAMI
12 KAONGA
13 DE NOONS
14 SENGWA
15 NBERI
16 MAROWA
17 MKUSHWE
18 MALILONGWE
19 BENDEZI
20 BUBYE
21 SINGWESI
22 UMZINGWANE
23 MASSABI
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ZAMBIA
MOZAMBIQUE
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MASHONALAND CENTRAL
MASHONALAND EAST
MATABELELAND NORTH
MATABELELAND SOUTH
MIDLANDS
MANICALAND
VICTORIA
Coalfield Locations
Hard Surfaced Roads
Loose or Unsurfaced Roads
Railroads
Airfields
Rivers
Province Boundaries
International Boundaries
KILOMETERS 0 50 100 150
MILES 0 50 100
Victoria Falls
Wankie
Bulawayo
Gwanda
West Nicholson
Gatooma
Que Que
Redcliff
Gwelo
Umtali
Fort Victoria
Beitbridge
Sinoia
Bindura
Shamva
Marandellas
Hartley
Lake Kariba
Zambezi River
Shangani River
Gwaai River
Shashe
Nata
Ruya River
Sabi
Odzi
Save
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